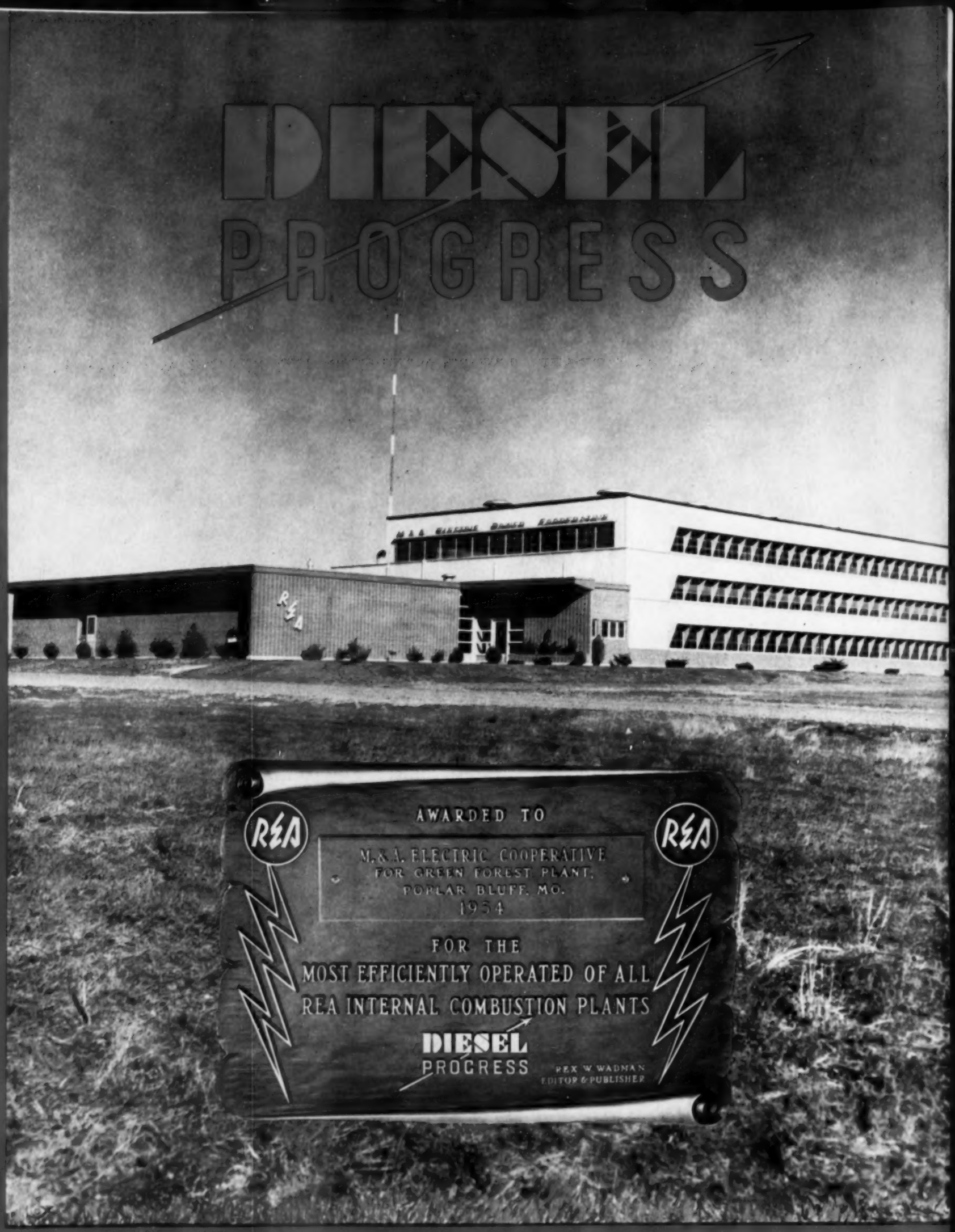
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

MAY, 1955

FIFTY CENTS PER COPY

"WE ENJOY REAL FUEL ECONOMY WITH TEXACO URSA OIL"

Elmer Leckrone,
Plant Superintendent,
Northwestern Public
Service Company,
Yankton, South Dakota

POWER PLANT of Northwestern Public Service Co., Yankton, S. D., has used *Texaco Ursa Oils* for 20 years. Fairbanks-Morse engines in service include three Model 33 slow speed diesels, one Model 38 OP high speed diesel, and one model 31 AD 18 dual-fuel unit.

TUNE IN:
TEXACO STAR THEATER
starring
DONALD O'CONNOR
or JIMMY DURANTE
on television...
Saturday nights, NBC.

TEXACO

TEXACO

NORTHWESTERN PUBLIC SERVICE Company's Yankton, South Dakota, plant operates both straight diesel and dual-fuel engines—all of them lubricated with *Texaco Ursa Oil*. Mr. Elmer Leckrone, Plant Superintendent, says:

"Never, in more than 20 years, has *Texaco Ursa Oil* 'let us down.' Our engines stay clean, wear is negligible, and we enjoy real fuel economy."

This experience is typical. *Texaco Ursa Oil* does a great job of keeping engines clean. It stands up under heat and pressure...stands off oxidation and sludging...keeps rings free for proper compression and combustion. This means you'll use less fuel...spend less for maintenance.

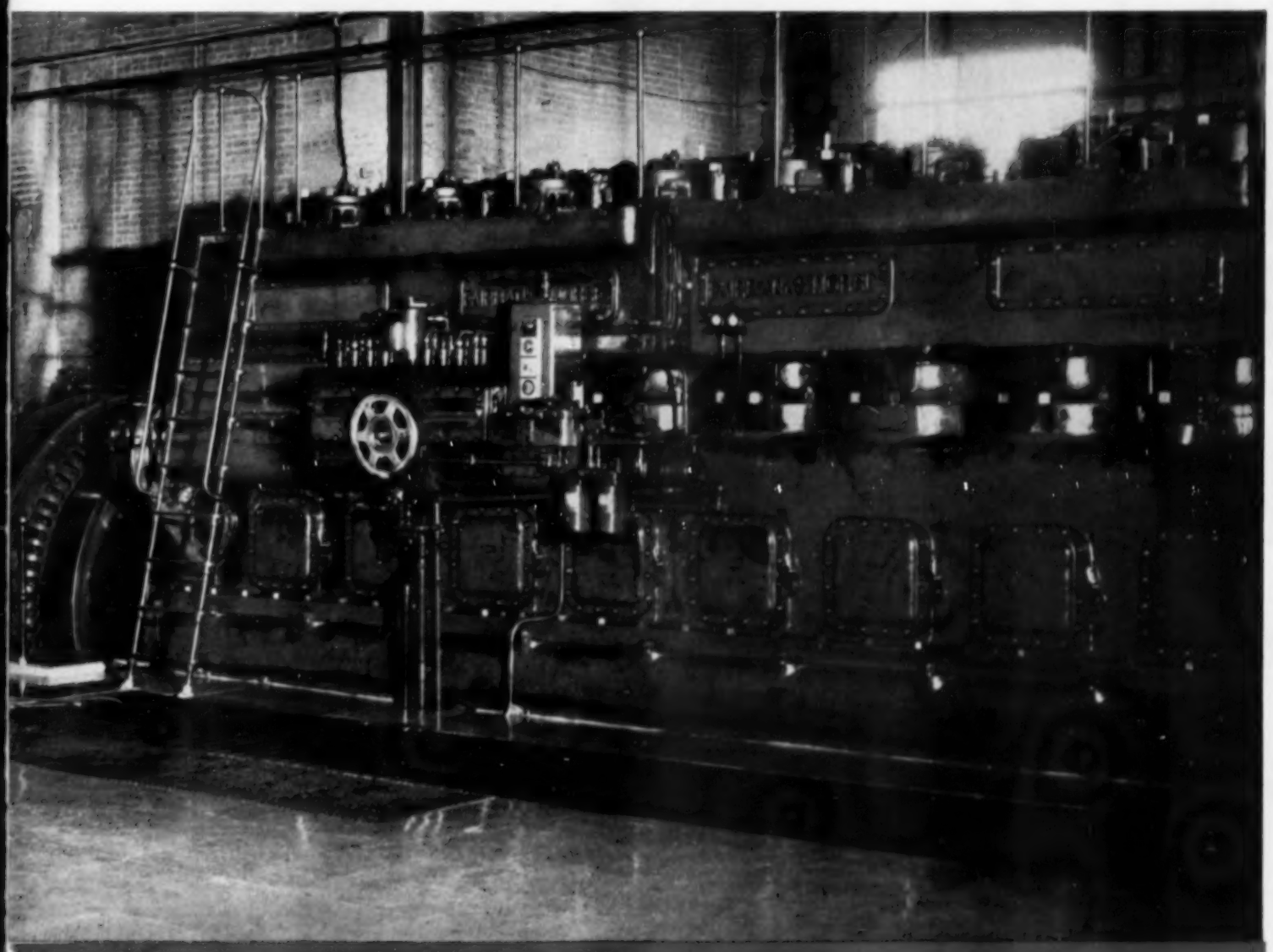
There is a complete line of *Texaco Ursa Oils* to give your diesel, gas or dual-fuel engines the best "run" for your money. Leading engine builders O.K. them, operators everywhere use them. In fact—

For over 20 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

Get the full story from your Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

HOFFMAN OIL CONDITIONER

helps Poplar Bluff win efficiency plaque

In winning the 1954 **EFFICIENCY PLAQUE** of Diesel Progress, the Poplar Bluff (Mo.) **REA** plant rates **HOFFMAN** Oil Conditioning a big factor in its performance record.

The Cooper Bessemer 16-cylinder Diesels at Poplar Bluff edged ahead in performance during the last few weeks of the record year... using the same lube oil that started the year's run, oil that was kept in shape all the way through by Hoffman Oil Conditioners.

Fuel also had Hoffman Filter protection, through a battery of Hoffman cellulose cartridge filters—with the resulting freedom from trouble in the injection systems.

Performance records like this occur in plant after plant when Hoffman filtration goes to work with Diesel installations. A Hoffman filtration engineer will be glad to show you specifically how the correct filtration equipment can improve your plant's operation—how soon the Hoffman units will pay for themselves! Please write, or call—

INDUSTRIAL FILTRATION DIVISION **U. S. HOFFMAN MACHINERY CORPORATION** Dept. DPR 105 Fourth Avenue, New York 3, N. Y.

DIESEL and GAS ENGINE PROGRESS

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IN INDUSTRY · IN TRANSPORTATION · ON THE SEA · IN THE AIR

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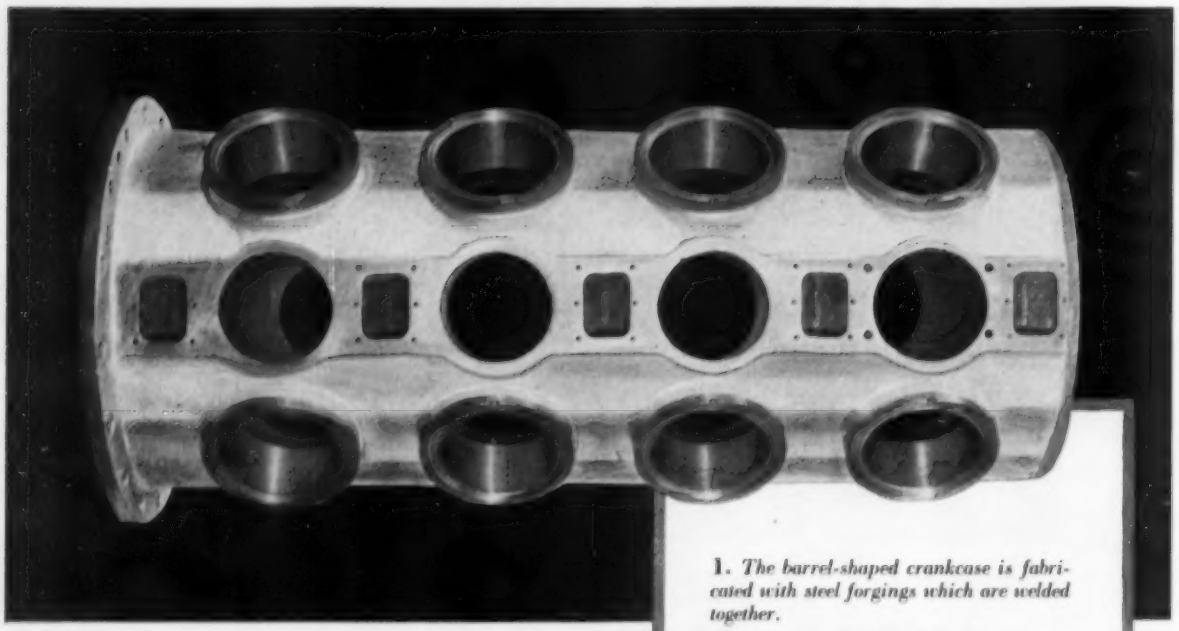
FRONT COVER ILLUSTRATION

An exterior view of the Green Forest plant of the M & A Electric Power Cooperative, Poplar Bluff, Mo., together with a reproduction of the DIESEL PROGRESS Efficiency Plaque, won in the national annual REA competition for internal combustion operations.

For **LOW-COST** *pipeline power*

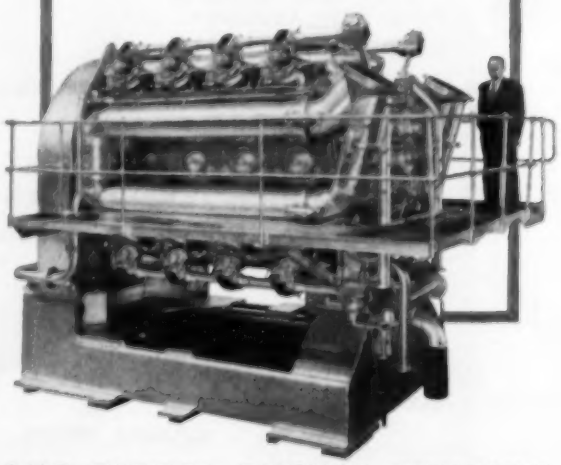


1. *The barrel-shaped crankcase is fabricated with steel forgings which are welded together.*

2. *The inner portion of the case with its bulkhead construction provides uniform main bearing support.*

3. *The individual cylinders are mounted to the crankcase by means of clamping rings.*

General Motors'
358-H
Gas Engine



DEVELOPED for quicker, easier maintenance, General Motors' 358-H engine cuts pipeline construction costs. This engine with attached accessories weighs less than 22 pounds per horsepower. Because of its light weight and smooth operation, foundation requirements are materially reduced.

This 2-cycle loop-scavenged engine, operating at 600 r.p.m., teams up with modern centrifugal compressors or petroleum pumps for efficient pumping.

Building or planning a pipeline, it will pay you to write today for full details and engineering specifications on this medium-speed General Motors 3300-horsepower gas engine.

GM CLEVELAND DIESEL

CLEVELAND DIESEL ENGINE DIVISION
General Motors • 2160 West 106th Street, Cleveland 11, Ohio

BUILDERS OF DIESEL, DUAL-FUEL AND NATURAL-GAS-BURNING ENGINES—FROM 150 TO 3300 H. P.

more flexibility

more wear life

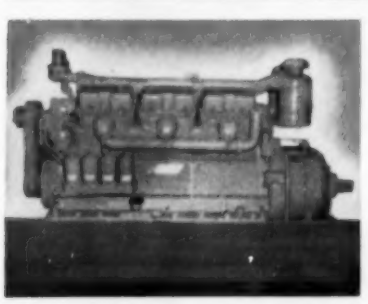
more work

from new

CATERPILLAR

Torque Converter

Power Units . . .

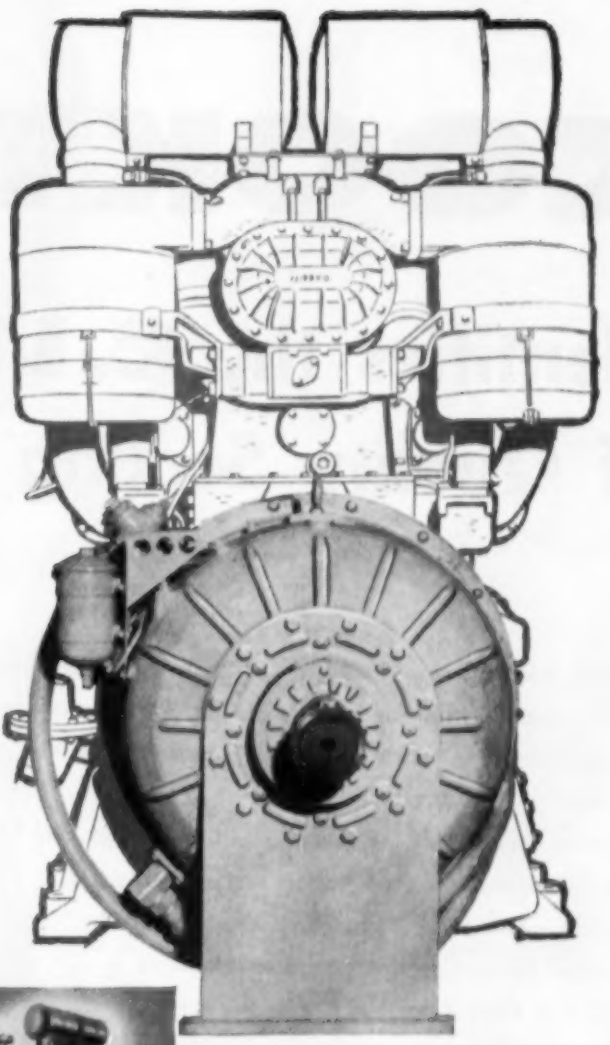


Caterpillar Torque Converter Power Unit — a Model D386 Cat Diesel working through Twin Disc Model CF Torque Converter.

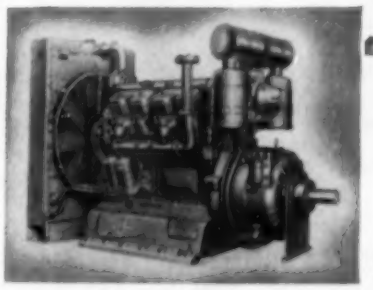
FOR THE FIRST TIME, you can order any one of 6 Cat Diesel Engines *Torque Converter-equipped at the factory* . . . as complete Torque Converter Power Units, developed through design teamwork by Twin Disc and Caterpillar engineers.

The result is *tremendous* performance—for power source and power linkage are *ideally* matched.

To give you a quick idea of how much Torque Converters mean to modern diesel power, here are a few facts you'll want to remember: on the new Cat Power Units, the Twin Disc Torque Converters • *match torque output automatically to the load* • *start loads smoothly* • *provide control of load movement without using clutch* • *prevent overloads from killing engine* • *permit hovering or holding under power* • *keep engines operating in maximum efficiency range at all times.*



Twelve different torque converter arrangements are available for six Caterpillar Diesels, up to 493 hp. Twin Disc also provides a wide choice of output shafts, for both in-line and side loads.



Cat D375 Torque Converter Power Unit. Twin Disc Torque Converters are standard equipment.

Whether you're thinking about a new power unit or planning to replace a present one, find out how much *more* flexibility, *more* wear life, and *more work* you'll get *through Twin Disc Torque Converter Drive.* Contact your engine dealer . . . he'll give you the facts and figures.

In the meantime, if you want more details on other Industrial-Type Torque Converters, write Twin Disc, Hydraulic Division, Rockford, Ill., and ask for Bulletin 135-D. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin; Hydraulic Division, Rockford, Illinois.

TWIN DISC

Torque Converters

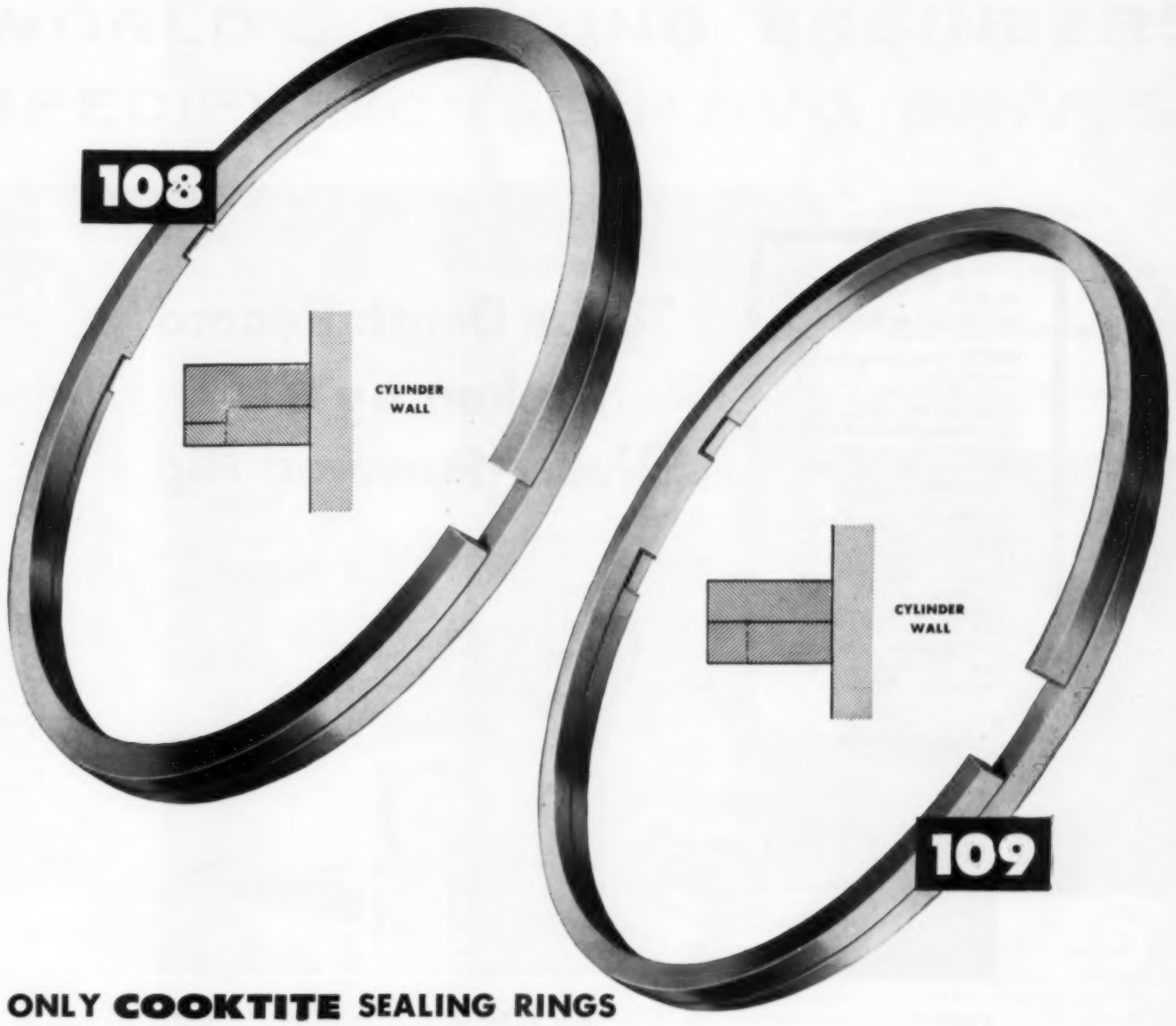
"COOKTITE"

identifies the C. LEE COOK family of Quality Sealing Rings!

TAKE your choice — 108, 109, 301-1X — they're all Cooktites! Each is a great piston ring in its own right. All are products of one manufacturer — the C. Lee Cook Company. Which rings you select will be dictated by the nature of the service, but whatever your choice, of this you can be certain — if it's a Cooktite you'll get a perfect seal *every time, all the time.* That's a promise from the pioneers in industrial piston ring design and development — the C. Lee Cook Company.

Mail the coupon (at right) direct to Louisville for complete engineering data, and specific recommendations for your units. No obligation, of course!

Look to COOK for Better Rings!



ONLY **COOKTITE** SEALING RINGS GIVE YOU ALL THESE ADVANTAGES!

- Insure perfect cylinder seal, thereby preventing blow-by which destroys lubricating oil film!
- Decrease rate of cylinder wear!
- Have special joint construction which eliminates compression leak characteristic of plain rings!
- Restore new engine power and performance to worn cylinders!
- Reduce fuel consumption in tapered cylinders!
- Assure long effective ring life due to superior materials!

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Sealing Pressures Since 1888

C. Lee Cook Company
976 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

Firm_____

Street_____

City_____ State_____

Attention:_____

Type of Units_____

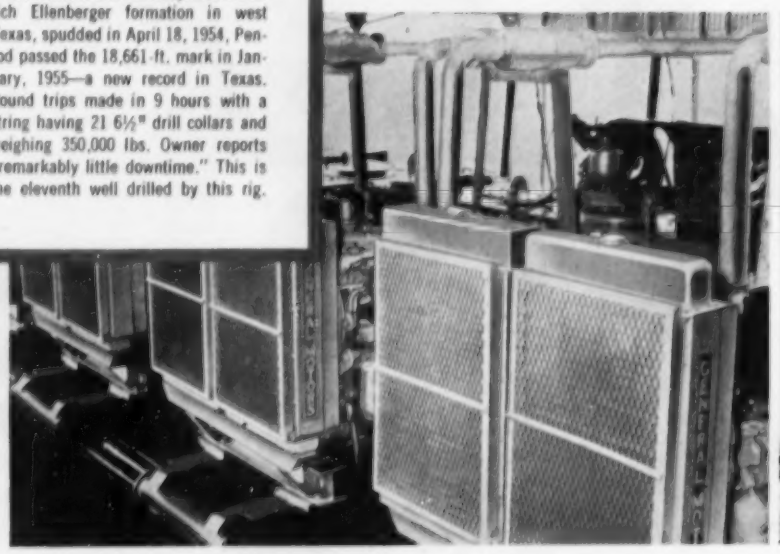
GM DIESEL
CASE HISTORY No. ID2-11

OWNER: Penrod Drilling Company, Shreveport, La.

INSTALLATION: 4 GM Twin "6-71" engines powering Brewster N-12 1500-horsepower "golden rig," with Lee C. Moore jackknife mast and two Wilson-Snyder 20" mud pumps.

PERFORMANCE: In deep-well test of rich Ellenberger formation in west Texas, spudded in April 18, 1954, Penrod passed the 18,661-ft. mark in January, 1955—a new record in Texas. Round trips made in 9 hours with a string having 21 6½" drill collars and weighing 350,000 lbs. Owner reports "remarkably little downtime." This is the eleventh well drilled by this rig.

Texas Depth Record Broken by GM Diesel-Powered Rig



DEWEY DAVIS, drilling superintendent for Penrod, will tell you it takes the *right* equipment, *good* crew work and *dependable* power to achieve a deep-well record like this.

And for big rigs that combine operating economy with portability, General Motors Diesel power is your best choice. Here are five reasons why:

1 **Low first cost**—as a result of General Motors' famous mass-production methods.

2 **Low fuel consumption**—unit injectors and blower scavenging mean more power from each gallon of fuel.

3 **Faster trips**—two-cycle design with power on every piston downstroke makes GM Diesel engines faster-accelerating.

4 **Quicker moves**—GM Diesels are more compact and weigh less than 4-cycle Diesels of comparable power rating.

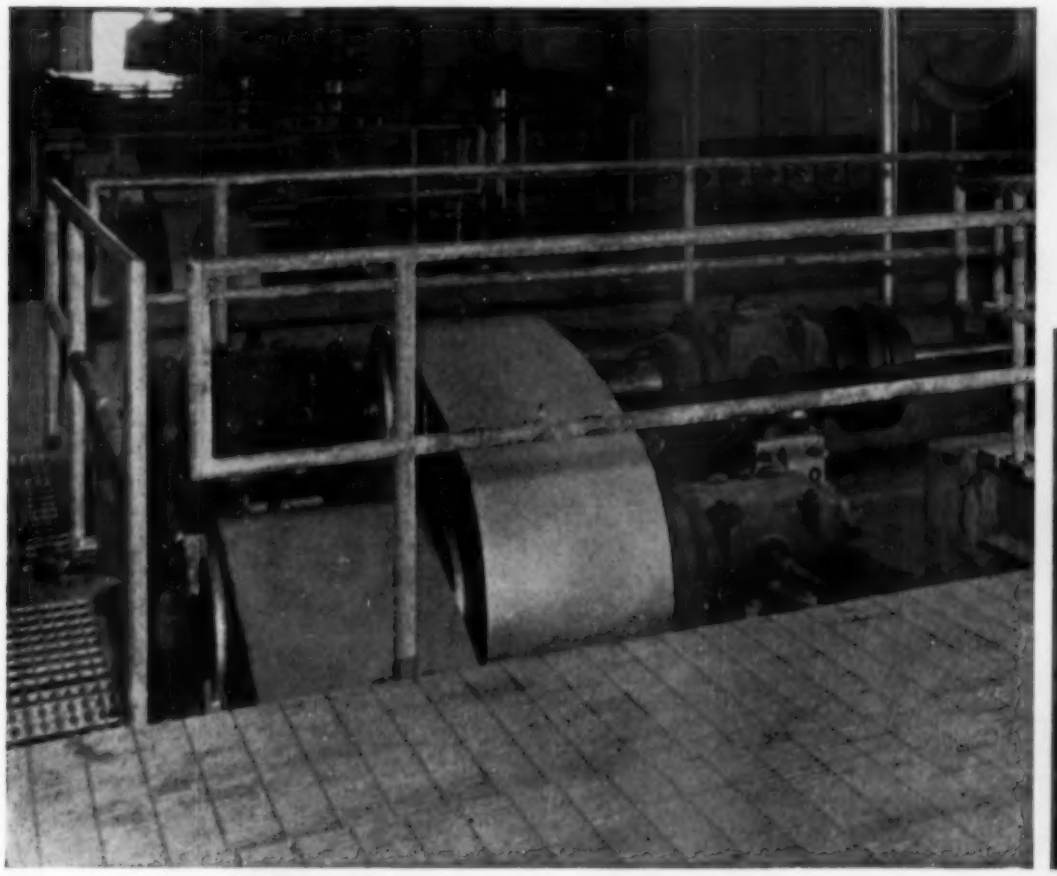
5 **Service and parts availability**—no matter what out-of-the-way location you drill in, GM Diesel parts and service are never far away.

Want to make hole at less cost? Ask your General Motors Diesel distributor for a free power survey, or write direct to us.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H. P. Multiple Units. . . Up to 893 H. P.

GM DIESEL POWER

WORLD'S LEADING ENGINEERS SPECIFY MORSE HY-VO DRIVES!



- FOR EFFICIENCY
- FOR DEPENDABILITY
- FOR ECONOMY
- FOR PERFORMANCE

Florida Flood Control Project: Dependable Morse HY-VO is on the job at the world's largest self-powered, low-lift pumping station. Designed to maintain a uniform water level in Lake Okeechobee, the project eliminates danger from floods and drought, permits the reclamation of 1100 square miles of potentially rich farm lands.

This pumping station houses six horizontal axial-flow propeller pumps, each with a capacity of 360,000 gallons per minute—a total capacity of 3.1 billion gallons per day! Each pump is driven by a 1600 hp opposed-piston diesel engine.

Morse HY-VO Drives were specified by the Army Corps of Engineers, as primary and secondary pump drives, for three reasons: (1) The field-proved performance of HY-VO assured round-the-clock dependability under severest operating conditions. (2) HY-VO permitted the use of lighter weight, lower cost engines. (3) Savings in required space for HY-VO Drives eliminated the need to increase the size of the buildings housing the pumping units.

This typical application of HY-VO is only one of a tremendous number where Morse HY-VO Drives are successfully used.

There are many reasons why Morse HY-VO is specified in applications demanding performance "extras": HY-VO's longer service life reduces per-hour operating cost; HY-VO is easy to assemble, install, and maintain on the job—keeps downtime *down*. Capable of transmitting up to 5000 hp in single-drive units, HY-VO runs at speeds up to 8500 fpm and makes possible the economies of using lighter weight, higher speed engines. HY-VO cuts vibration to a minimum, runs smoothly and coolly while transmitting power with less sprocket-tooth wear and more than 99% efficiency.

HY-VO is available from your local Morse Representative's stock. Wire, write, or phone him today, for complete HY-VO information. Put dependable Morse HY-VO to work cutting costs on your heavy-duty drive applications.

Find out, too, about the other quality products that your local Morse Representative stocks for your power transmission requirements: Morse Roller Chain, Silent Chain, Sprockets, Couplings, and Clutches. MORSE CHAIN COMPANY, INDUSTRIAL SALES DIVISION, ITHACA, NEW YORK.

MORSE BW **CHAINS, COUPLINGS, AND CLUTCHES**

"Smoother stripping -cuts cable costs"

Allison TORQMATIC equipped Osgood dragline owned by J. C. Kitzmiller Coal Co. Unit has 3-yard bucket, 80 foot boom, strips 1000 tons of coal per month.

AFTER 2,000 hours of low-cost strip-mining, veteran mine owner J. C. Kitzmiller reports "smoother stripping — reduced cable cost" due to shock-free power transmission in his Osgood dragline. The savings he's made with his Allison TORQMATIC Converter have made him decide to specify Allison TORQMATIC DRIVES in future equipment.

He's spending less for cable replacement in his Osgood dragline because the TORQMATIC Converter protects cable by absorbing sudden shock loads.

He's spending less for dragline repairs, too. The TORQMATIC Converter gives the operator time to cut off power—"throw out the drag"—when the bucket hits a snag, guards boom and drive line from harmful overloads.

And he's getting more work from his drag because with fewer repairs it stays on the job *earning* money—out of the shop *costing* money.

The TORQMATIC Converter matches engine power to load demand, helps prevent harmful engine lugging and stalling. It multiplies engine torque up to 3½ times—broadens the engine's effective horsepower range.

When load demand is equal to, or less than, engine torque the Allison TORQMATIC Converter acts as a fluid coupling to conserve fuel, boost engine life. This feature is standard equipment in every Allison Converter.

You can produce more for less with shock-free TORQMATIC power transmission in your 40- to 400-horsepower gasoline or Diesel equipment. Ask your manufacturer or dealer about TORQMATIC DRIVES in your equipment or write for more information to: Allison Division of General Motors Box 894D, Indianapolis 6, Indiana

ALLISON TORQMATIC CONVERTER

Simple Design — one-piece cast converter elements — minimum maintenance

Compact, easy to install in existing equipment

Designed for power applications in the 40 to 400 horsepower range

Longer Equipment Life — absorbs shock, eliminates harmful engine lugging, cuts maintenance costs

GM GENERAL MOTORS

Allison **TORQMATIC DRIVES**

Compact, efficient hydraulic drives for Cranes • Trucks • Tractors • Scrapers • Shovels • Drilling and Servicing Rigs

"Engine Cooling System Problems Can Be Prevented" says,

Joe Vittel

Manager—Perry Filter Division
R. M. Hollingshead Corporation

Generally, we overlook the very important fact that a clean cooling system is not an end in itself but rather the means to an end; a guarantee of longer engine life . . . fewer engine breakdowns . . . less maintenance costs.

In the past, most of our attention has been directed to the curing of an already developed "headache" (acute cooling system distress). We remove the trouble and then believe everything is well with the system.

Actually, we are ignoring the fact that the trouble should have been—*could have been*—avoided completely, simply by maintaining a constantly clean cooling system.

To accomplish this, we must realize cooling system trouble is of two kinds: 1.—that caused by water scale, rust, oil and other foreign matters; and 2.—that caused by corrosion—actual chemical and electro-chemical destruction of metals. Both cause clogged systems and insulating deposits in critical heat transfer areas ("Heat-wear zones"), and are responsible, in a large degree, for premature overhauls due to worn pistons, rings and liners and distorted valves, seats and stems.

The answer in one small unit, to both kinds of cooling system trouble, is the Perry Cooling System Filter and Conditioner. It gives complete, two-way protection . . . is easily installed . . . and requires a minimum of service—the simple, inexpensive replacement of a chemically activated element.

It has won the enthusiastic approval of most leading engine manufacturers.

We guarantee this: Correctly installed on any new engine, and properly serviced, the Perry Filter and Conditioner will keep the cooling system clean and eliminate a major cause of costly breakdowns—on old engines the Filter will gradually clean the system and reduce the cost of upkeep.

Write me at the Perry Filter Division for the full story on the Perry Filter, and the names of local Perry users, or see your local Perry representative.

Great Southern Trucking says:

"Block cracking eliminated . . . longer life between overhauls with Perry Cooling System Filters"

Today, all of Great Southern's fleet (upward of 500 power units) is Perry Filter protected. Here's why this top flight trucking concern took this special step.

A large portion of Great Southern's power is in lightweight tractors to meet local state weight restrictions. Running this light equipment on rigidly tight schedules produced a high incidence of cracked blocks. Maintenance investigations showed the fundamental trouble was engine overheating . . . cooling systems were not functioning properly despite frequent periodic check-ups.

To combat a growing number of cracked blocks, D. D. Hodges, System Maintenance Superintendent, authorized purchase of Perry Cooling System Filters for his lightweight power.

Block cracking was eliminated! The Perry Filter kept the engine cooling system permanently clean. There was no more overheating—no more cracked blocks. The amount of repair was substantially cut. These savings justified the use of Perry Filters on the rest of the Great Southern fleet. All new power, including a recent purchase of ten West Coast Internationals, is now equipped with Perry Filters before going on the road.

This is a strong testimonial from one of America's largest and most efficiently run trucking concerns. For the same economies in maintenance and service, investigate Perry Cooling System Filters for your gasoline and diesel powered engines. A *permanently* clean cooling system saves time, money and trouble.

PERRY FILTER DIVISION
R. M. Hollingshead Corporation • 840 Cooper Street, Camden 2, New Jersey

ELECTRO-CHEMICAL
Perry
COOLING SYSTEM
filter
and CONDITIONER

Mail this coupon for full information.

Perry Filter Div., R. M. Hollingshead Corporation
841 Cooper St., Camden 2, New Jersey

Please send complete information on the Perry Cooling System Filter and Conditioner.

Name_____

Firm_____ Position_____

Address_____

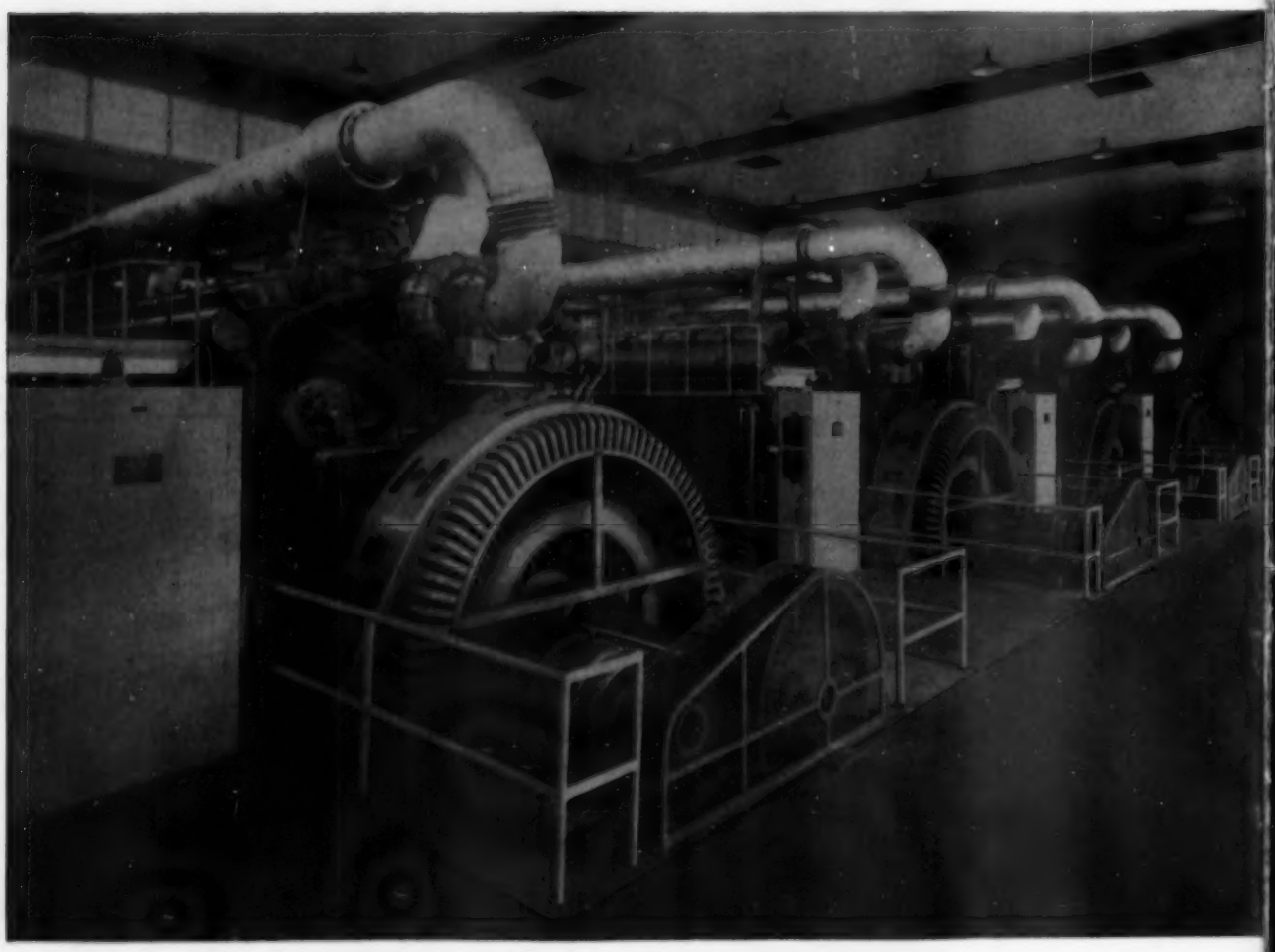
City_____ Zone____ State_____

Gulf Dieselmotive

contributes to efficiency record

Modern office building and plant of the M & A Electric Power Cooperative, Poplar Bluff, Missouri, winner of the 1954 Diesel Progress Efficiency Award.

Gulf Dieselmotive Oil provides the vital lubrication for these four Cooper-Bessemer 16-cylinder Diesels in the M & A Plant.



Oil

at award-winning Diesel plant

The M & A Electric Power Cooperative of Poplar Bluff, Missouri, has been named winner of the 1954 Diesel Progress award for the most efficiently operated REA internal combustion plant.

Gulf Dieselmotive Oil provides the kind of lubrication necessary for such an award-winning performance! This modern Diesel lubricant protects the four Cooper-Bessemer 16-cylinder Diesel engines in the M & A Plant against excessive wear, and contributes to efficient operation and lower maintenance costs.

Here's why:

1. Effective detergent action prevents harmful piston ring belt deposits.
2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.
3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Investigate the operating savings possible with Gulf Dieselmotive Oil in your Diesels. Contact your nearest Gulf office today and have a Gulf Sales Engineer recommend the proper grade.

GULF OIL CORPORATION • GULF REFINING COMPANY

1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Nordberg Diesel Completes Almost 4 Years of Round-the-Clock Operation at Hudson, Mass.—On the line 91% of this time

City Now Orders Larger Nordberg Engine Rated 5100 bhp.

HUDSON, MASS. Since going on the line at this modern, efficient municipal light and power plant almost four years ago, a 4250 bhp. Nordberg Diesel engine has been operating 91 per cent of the time, working a "round-the-clock" schedule 7 days a week. Throughout this period the "work-horse" engine has never had a forced shutdown due to engine failure, is the most efficient unit in the entire 7-engine plant and is guaranteeing a source of continuous, dependa[ble] power at low cost for the surro[unding] communi[ty]

The a[dditio]n of the 3300 kv[a] berg h[as] Con[sulting] op[erating]

her oblig[ations]

Repr[esentative] missior[ners] commi[ssioners] Mar[ch] the[ir] on [the] twe[nty]

Pa[ge] se[ssion] H[ouse]

● From the day this big 10-cylinder 4250 bhp. Nordberg 2-cycle Diesel went on the line, it has been the Hudson plant's base load unit, generating an average of 75 per cent of the plant's total production. *It is almost never idle, operating around the clock, Sundays and holidays included, and is shut down only a few times a year for inspection and preventive maintenance.*

With this outstanding record of reliability, plus extremely low operating and maintenance cost, it naturally followed that when this plant needed additional capacity, they again chose Nordberg. A second large Nordberg Diesel will be installed in the Hudson, Mass. plant in the summer of 1955. This 2-cycle unit, rated 5100 bhp., will operate at 240 rpm., 75 BMEP.

Here again is further proof of the kind of dependable performance that users have learned to expect from Nordberg Engines . . . in sizes from 10 to over 10,000 hp.

NORDBERG MFG. CO., Milwaukee, Wis.

© 1955, Nordberg Mfg. Co. P1.54

THIS PUMP OPENED NEW DIESEL MARKETS...

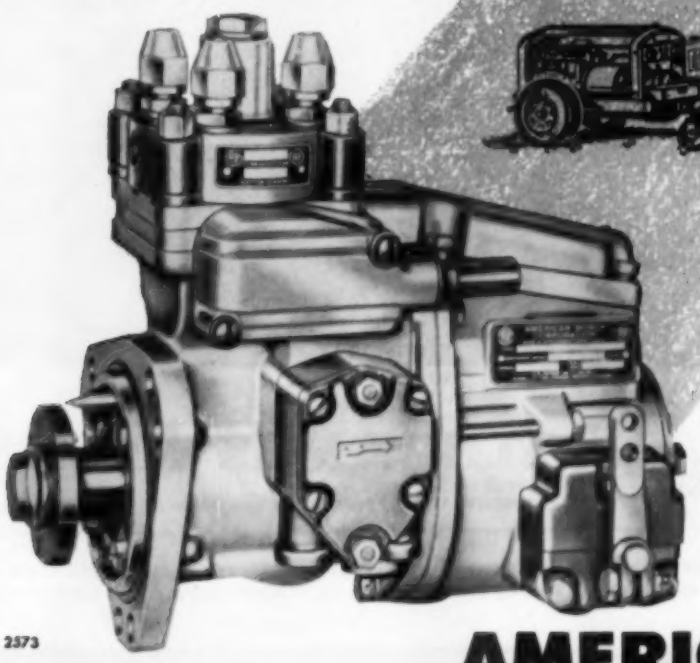
THE AMERICAN BOSCH "PSB"

American Bosch's development of the PSB single-plunger pump made it possible for engine manufacturers to produce the smaller, lower-cost Diesels which have opened up new markets for Diesel power. You see it serving everywhere —on efficient Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

Today, more Diesel engine manufacturers are using the American Bosch PSB as standard equipment than ever before. It's easy to see why —for the PSB gives both the engine manufacturer and the user a simplified, compact, lower-cost pump with a *proven* record of outstanding performance and dependability *plus* ease of servicing and low maintenance expense.

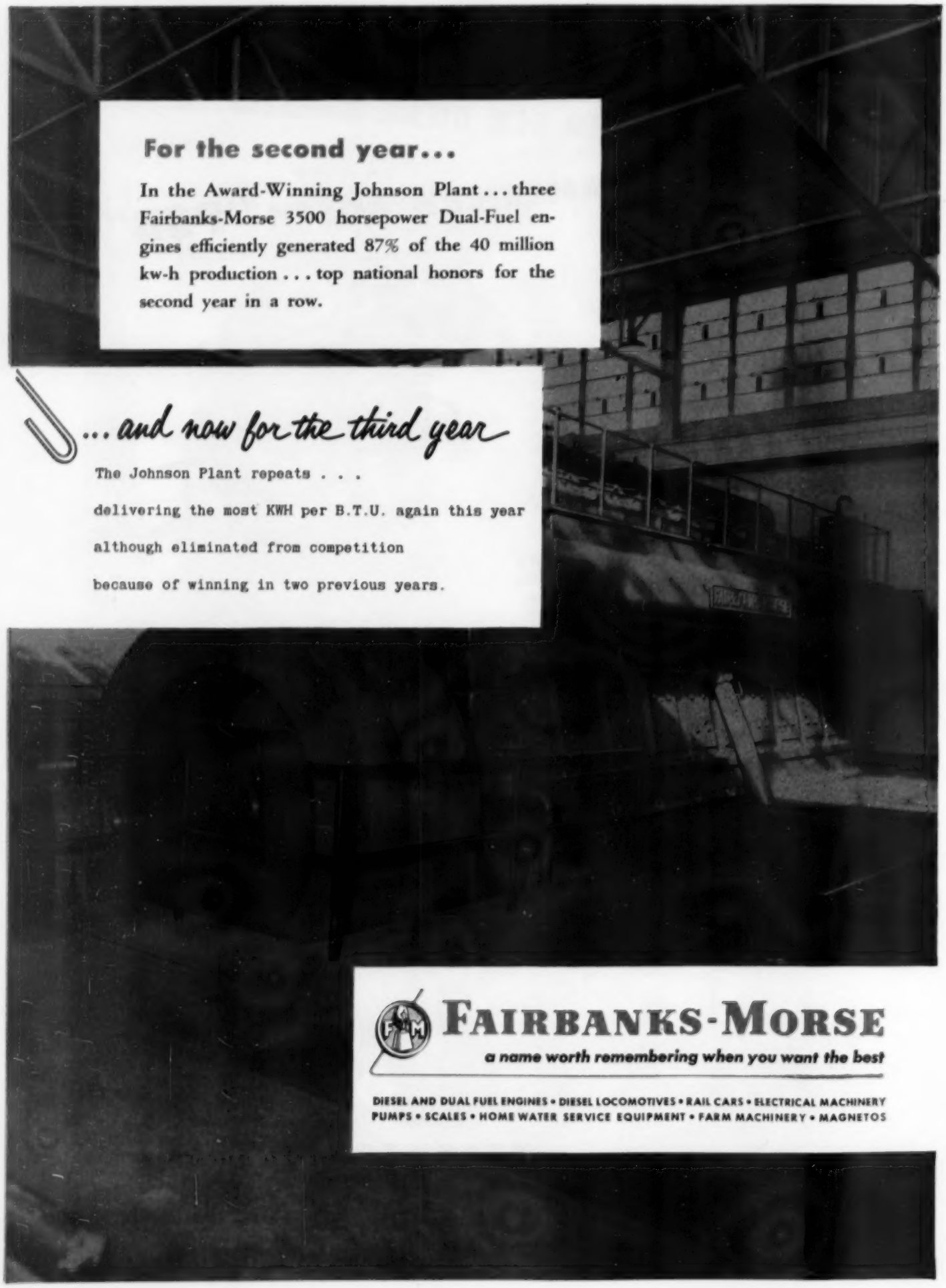
The PSB is a product of American Bosch's continuing program of research and development. It stands as a significant contribution to the progress of the Diesel.

AMERICAN BOSCH, Springfield 7, Mass.



2373

AMERICAN BOSCH



For the second year...

In the Award-Winning Johnson Plant... three Fairbanks-Morse 3500 horsepower Dual-Fuel engines efficiently generated 87% of the 40 million kw-h production... top national honors for the second year in a row.

...and now for the third year

The Johnson Plant repeats . . .

delivering the most KWH per B.T.U. again this year

although eliminated from competition

because of winning in two previous years.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

"Trane is giving us the exact performance we specified!"

Trane Fluid Cooler engineers know actual field performance because Trane makes its own coils... and has been making them for 30 years.

That's why TRANE can say "Yes!" to your design requirements—*and deliver!*

TRANE has *field experience* covering virtually *all* types of coils and fans under *all* types of operating conditions—plus a tremendous backlog of supporting engineering design and laboratory test data.

That's why TRANE can more accurately tell horsepower consumption beforehand. And guarantee complete unit quality. TRANE *controls the coil's quality!*

Want the *complete* story on TRANE Fluid Coolers? Call your TRANE Sales Office or write TRANE, La Crosse, Wis.

FACTORY ALIGNMENT *of motor and gear box simplifies field installation, minimizes vibration—assures longer life! Complete drive unit shipped assembled.*

TRANE

MANUFACTURING ENGINEERS

One source, one responsibility for: Air Conditioning Heating • Ventilating • Heat Transfer Equipment

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa.
Trane Co. of Canada, Ltd. Toronto • 90 U.S. and 17 Canadian Offices

ELECTRIC POWER

DELCO-REMY HEAVY-DUTY A. C. GENERATORS

Delco-Remy A.C. generators with companion regulators and rectifiers are the hearts of 12-volt A.C.-D.C. electrical systems designed specifically for modern diesel buses with fluorescent lighting and extra-heavy electrical loads.

Desirable performance characteristics include cut-in at low generator rpm . . . maximum outputs (ranging up to 180 amperes) at low to medium speeds. The new generators supply not only alternating current for fluorescent lights but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

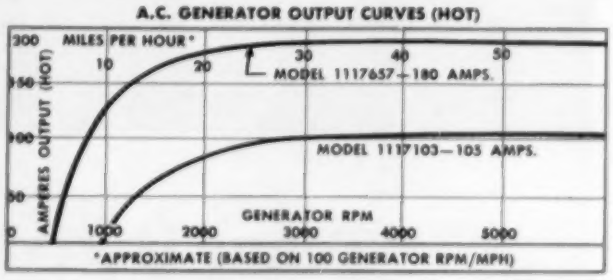
Impressive features of the new generators are their light weight, very high output capacity, and ability to operate over a wide speed range with greatest efficiency. Specify Delco-Remy electrical equipment on your new buses.

A.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117103	12	960	5	105	1575	All speeds.
1117657	12	550	130	180	2700	All speeds.
1117062-3-4	6	750	38	90	720	All speeds.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

A.C. GENERATOR OUTPUT CURVES (HOT)



*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

DELCO-REMY HEAVY-DUTY D. C. SPLIT-FIELD GENERATOR (120-Ampere Output Capacity)

The Delco-Remy 12-volt split-field generator and its companion regulator are rugged and dependable—designed to meet the needs of diesel transit buses having increased electrical loads coupled with a high percentage of engine idling time.

Desirable performance characteristics include low cut-in, maximum output at less than 1,000 generator rpm. Note performance table at right.

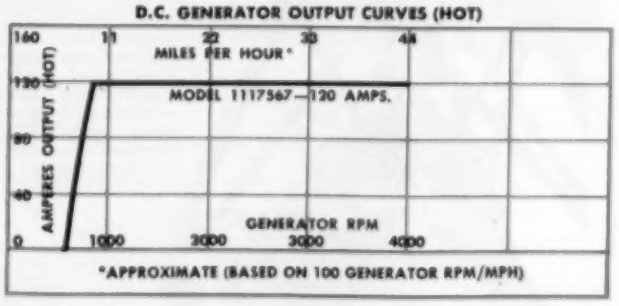
Operating benefits include reduced battery cycling, long battery life, and a simplified electrical system with sustained voltage—at no sacrifice in ruggedness or dependability.

D.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117567	12	560	120	120	1800	Low speed & idling.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

D.C. GENERATOR OUTPUT CURVES (HOT)

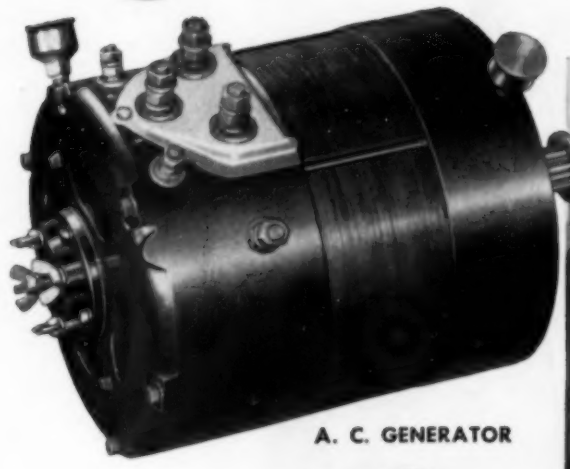


*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

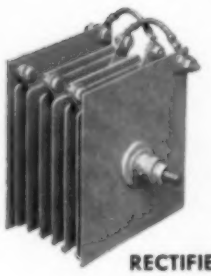
Delco-Remy
ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

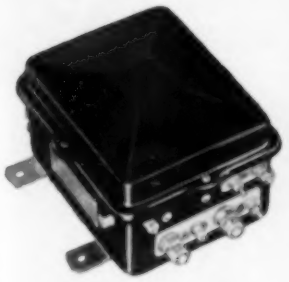
right for the job



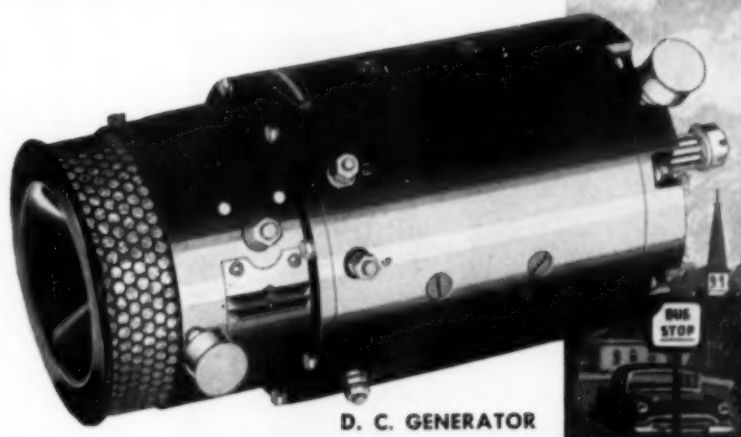
A. C. GENERATOR



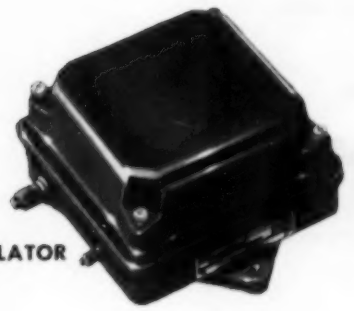
RECTIFIER



REGULATOR

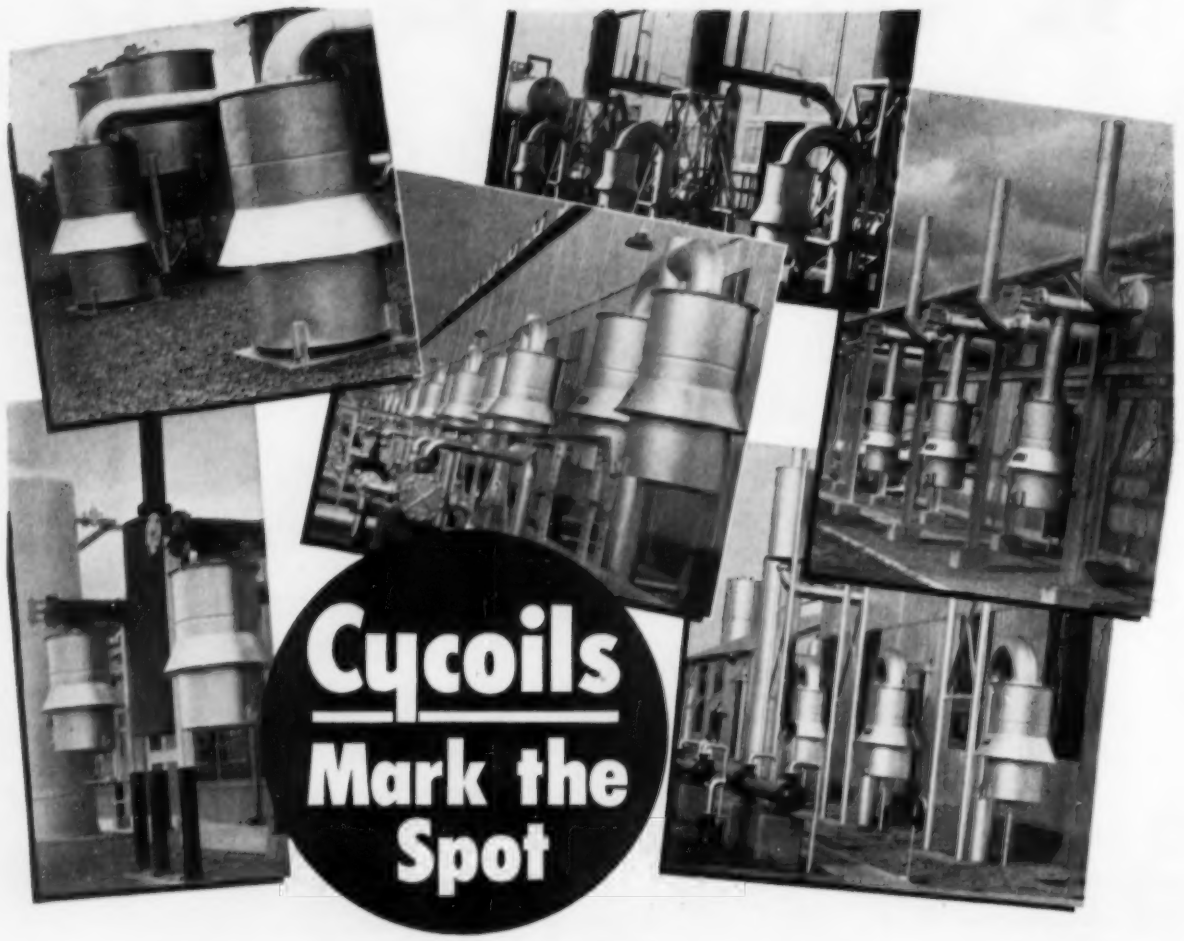


D. C. GENERATOR



REGULATOR

WHEREVER WHEELS TURN OR PROPELLERS SPIN



Where Engines and Compressors Enjoy Complete Dust Protection

Such spots are numbered by the hundreds. Nor are all of them confined to the "dust bowl" areas of the nation. Find a cost-minded management that recognizes how dust damage contributes to engine down-time and repairs and you'll find dependable Cycoil Oil Bath Air Cleaners on the job.

What's the secret of Cycoil's industry-wide acceptance? They're designed to fight for every particle of dust. Thorough mixing of oil with the intake air at the start results in over 90% of the dust content being trapped before it even reaches the Cycoil's filter pads. Then comes the final cleaning action of the filter pads for removal of the remaining 10%. Net result—approximately 100% clean air.

Why not get a firsthand report from the folks who really keep a running score on Cycoil performance? Write us today for list of representative users and complete Cycoil data.

AAF **American Air Filter**
COMPANY, INC.

408 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

Four 1750-Horsepower GP9's delivered to **Western Maryland**

The General Purpose Diesel locomotive, designed and developed by Electro-Motive, brought a new concept of versatility and economy to railroading—a locomotive that can handle branch- or main-line passenger and freight *and* step into the yard to take on a wide range of yard and switching work. It helps railroads reach complete dieselization with a smaller number of units.

More than 16,000 General Motors Diesel locomotive units are earning money for railroads on six continents

La Grange, Illinois • Home of the Diesel Locomotive

GENERAL MOTORS LOCOMOTIVES

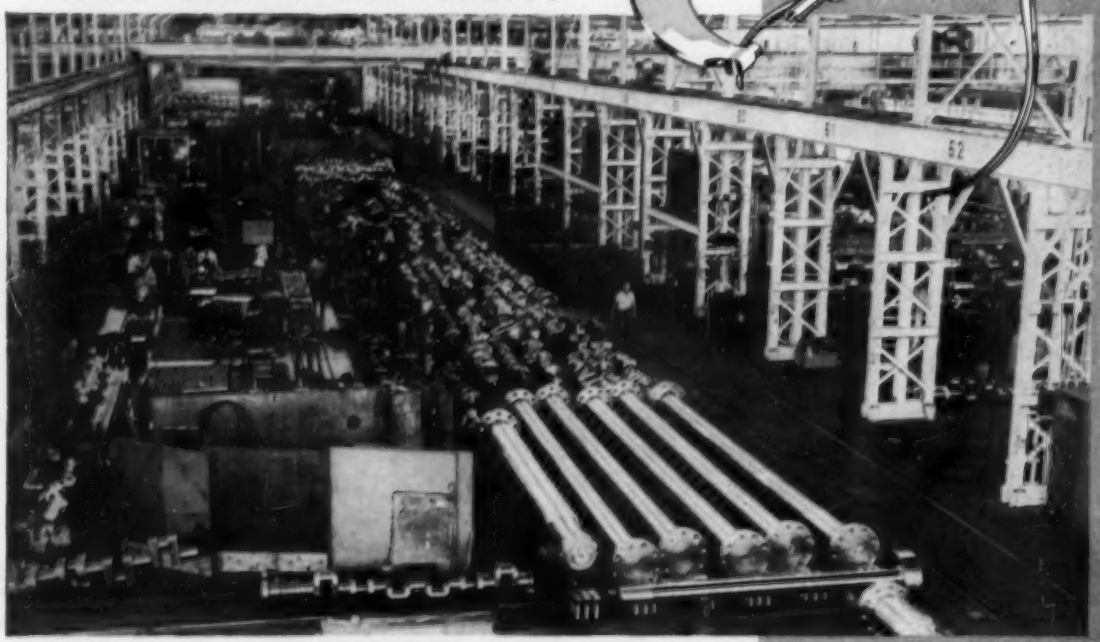
In Canada: GENERAL MOTORS DIESEL, LTD., London, Ontario

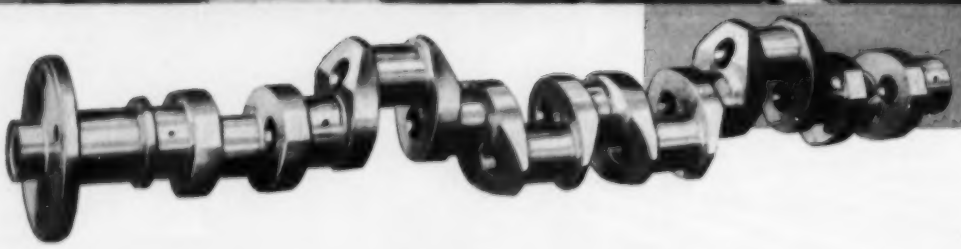
ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

TONS OF STEEL...

precisely machined—

ERIE CRANKS AND SHAFTS



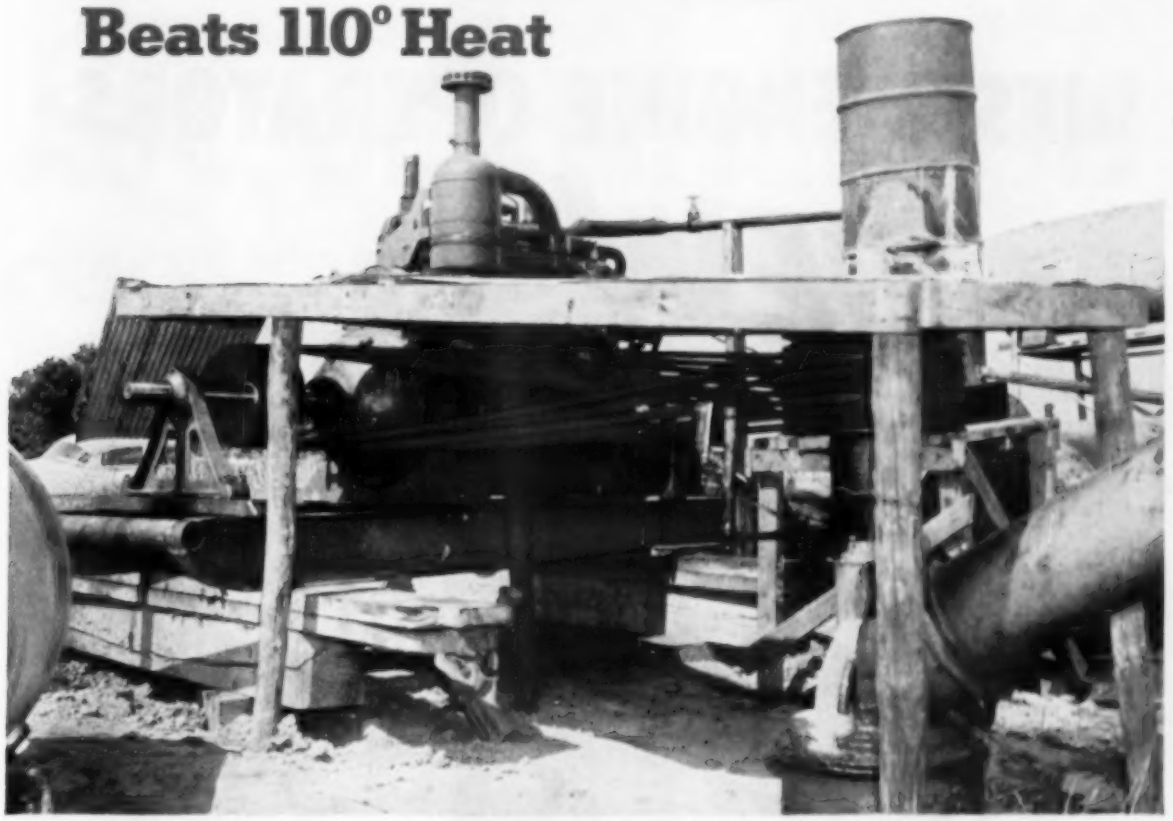


Here are tons of Carbon and Alloy Steel, precisely machined for a variety of applications. Shown is one of the three quarter mile long bays in our plant, all of which are devoted to careful machining operations on shafting, crankshafts and connecting rods. Here the finest machines combine with experienced craftsmen to produce exactly the right part finished to rigid specifications. The experience of many years in every operation from ingot to finished crank is available here at Erie. Consult with us on your next crankshaft, shafting or connecting rod requirements.

ERIE FORGE & STEEL CORPORATION

ERIE, PENNSYLVANIA

UD-1091 Irrigation Engine Beats 110° Heat



4500 GALLONS PER MINUTE is the output of this INTERNATIONAL UD-1091 diesel engine that irrigates a 300-acre tract of riceland near Hollandale, Mississippi, that nets an average yield of 70 bushels to the acre.

Mississippi farmer gets yield of up to 100 bushels of rice an acre with 190 HP. INTERNATIONAL Diesel on pump

There's one dependable, low-cost way to put necessary water on ricelands in Mississippi when the thermometer skyrockets to 110 degrees and that's to turn on an INTERNATIONAL engine on the irrigation pumps.

That's all J. L. Zumwalt, rice farmer from Hollandale, Mississippi, does and his 190 HP. INTERNATIONAL UD-1091 diesel engine takes over and delivers 4500 gpm on a 14-inch deep-well turbine pump from a depth of 150 feet to water a 300-acre tract of riceland.

The owner says: *"I've had no shutdown time and my UD-1091 furnishes plenty of water for 300 acres. I like the service I get from my local* INTERNATIONAL *Power Unit Dealer, too."*

Check the facts from your INTERNATIONAL Power Unit Distributor or Power Unit Dealer and you'll see, too, why INTERNATIONAL is STAY-PUT POWER, delivering full-rated horsepower consistently over years of hard pumping.

In all, there are 18 INTERNATIONAL diesel and carbureted pumping engines. You can choose one just right for your pumping needs, since they range from 16.5 to 200 horsepower. Get the full facts and you'll get INTERNATIONAL for low-cost, dependable pumping power.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL
INDUSTRIAL POWER
MAKES EVERY LOAD A PAYLOAD

DIESEL ENGINE OPERATORS

A NEW PM TOOL

ADC* Oilprint Analysis

CHECKS CRANKCASE OIL IN MINUTES

Shell Research gives you new oil-change yardstick—

Now—operators can test crankcase oil in the short time allotted for refueling and crankcase oil checks. The Shell ADC Oilprint Analysis gives a practical and accurate oil evaluation in minutes.

ADC Oilprint Analysis means big savings when used in your preventive maintenance program . . . gives valuable information on engine and oil conditions. It answers the question "When do I change my oil?" thus eliminating the draining of usable oil and the risk of using oils loaded with contaminants.

See for yourself how the new Shell ADC Oilprint Analysis can save you money in preventive maintenance. Let us show how you can use this new service for your diesels.

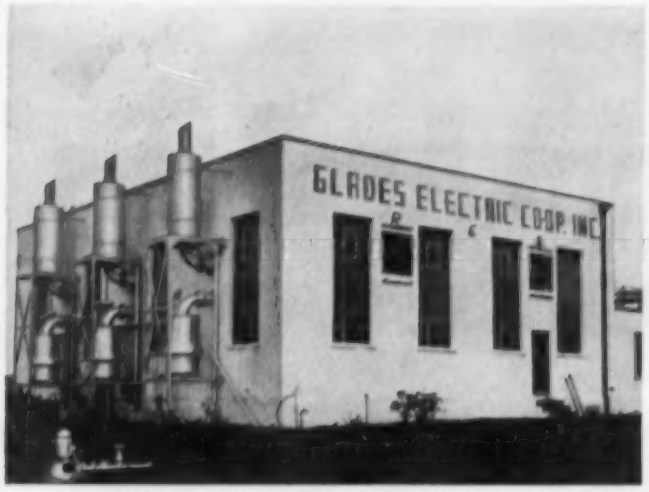
SAVES... Time, Money, Engines, Oil

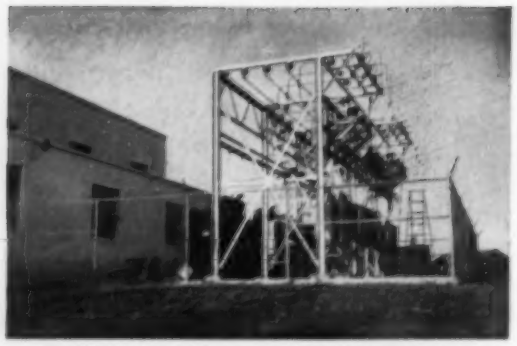
*Trademark

SHELL OIL COMPANY,

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

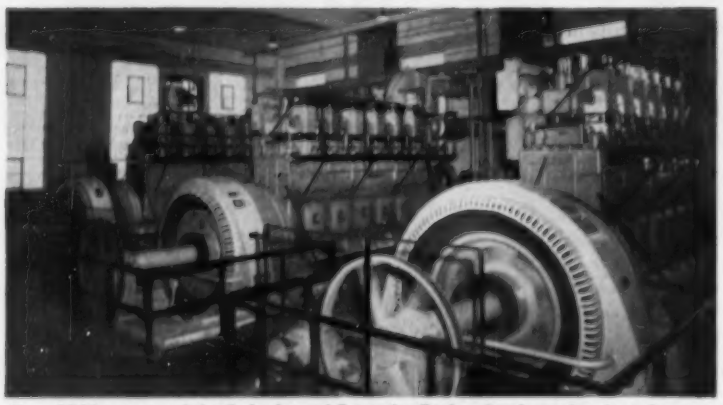




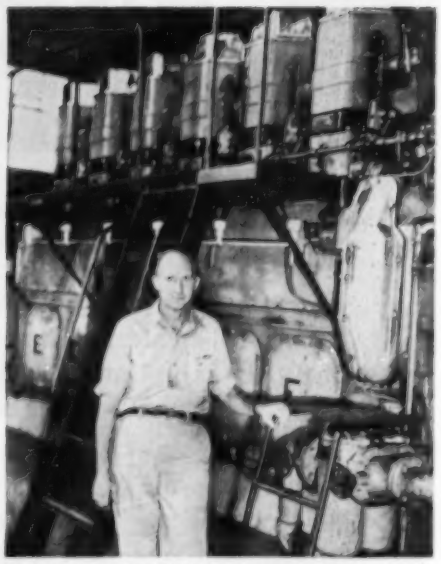
2500 KW Enterprise-powered REA Co-op serves homes, business, industry and agriculture in broad area up to 450 miles distant. New plant has never had a power failure.

Two Enterprise Model DSQ-36 Diesels, each rated 1200 HP at 327 RPM, were installed in 1948, followed by third in 1952. Economical operation has reflected in reduced KW cost.

REA Co-op proves Enterprise dependability —no power failures here!



Since 1948 not one of the Turbocharged Enterprise Engines has been shut down for more than two hours for minor repairs or adjustment—even when operating at peak load of at least 20 out of 24 hours, six months at a time.



W. B. Irby, Jr., the Glades manager says: *"Our excellent operating record speaks for itself, and certainly speaks well for both my Superintendent, Mr. Keenan, and Enterprise Engine & Machinery Co. If we have our choice, we will never have anyhing in our plant but an Enterprise."*

If power failed at Moore Haven, located in the heart of Florida's hurricane belt, untold loss of life and property could result. That's why Glades Electric Co-op, Inc. installed two heavy-duty Enterprise Engines when it repowered its plant in 1948.

Four years later this plant added its third Enterprise Engine, boosting total capacity to 2500 KW—and the security of a completely adequate and dependable generating plant capable of meeting maximum power requirements—normal or emergency.

Whatever the municipal power application, specify Enterprise Engines for *security* . . . units from 73 to 6150 HP for stationary or portable electric service, flood or water pumping systems, sewage plant power. Write Enterprise direct about your problem, or contact the Enterprise sales engineer in your area, today.

Over a million horsepower at work the world over!

ENTERPRISE dependable ENGINES

THE SWITCH IS TO ENTERPRISE
CHOICE OF POWER EXPERTS

ENTERPRISE ENGINE & MACHINERY CO. • Subsidiary of General Metals Corporation • 18th and Florida Streets, San Francisco 10, California

Boston • Chicago • Denver • Jacksonville • Kansas City • Los Angeles • Minneapolis • New Orleans • New York • San Diego • Seattle • St. Louis • Washington, D.C.

Standard Engineer's Report

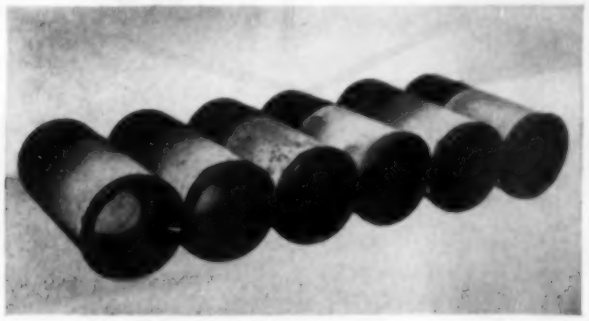
CASE HISTORY

PRODUCT *RPM Delo Oils*

FIRM *E. M. Tharp Trucking Co., Porterville, Calif.*

Only 0.0015" sleeve wear in 170,000 miles!

RPM DELO SPECIAL LUBRICATING OIL, and drivers who are trained to avoid practices that shorten engine life, keep maintenance costs to a minimum in the 16 diesel and gasoline rigs owned by E. M. Tharp Trucking Co., Porterville, Calif. Engine in truck above, pulling out with a typical 24-ton load of cottonseed, gives "good as new" performance after 140,000 miles without overhaul. Other engines give similar service in spite of much hauling up 22 miles of constant grade on the Ridge Route to Los Angeles. Sleeves below, shown just as they came from one of the engines after 170,000 miles, have only 0.0015" wear! Owner E. M. Tharp says, "RPM DELO Oils keep our engines cleaner than any oil we've ever used. And bearings stay in such good condition that we often leave them in when we overhaul."



FREE FOLDER tells you about all the RPM DELO Oils and how they meet every heavy-duty engine condition. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your nearest distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oils reduce wear, corrosion, oxidation in all heavy-duty engines

A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

A NEW ARRIVAL

To the Petter air-cooled diesel engine family

1½ & 2½ H.P.

Range NOW 1½ - 40 H.P.

BACKED BY A WORLD-WIDE PARTS AND SERVICE ORGANISATION FOR THE 360,000 ENGINES IN USE

WRITE FOR INFORMATION
A FEW CHOICE DISTRIBUTORSHIPS OPEN

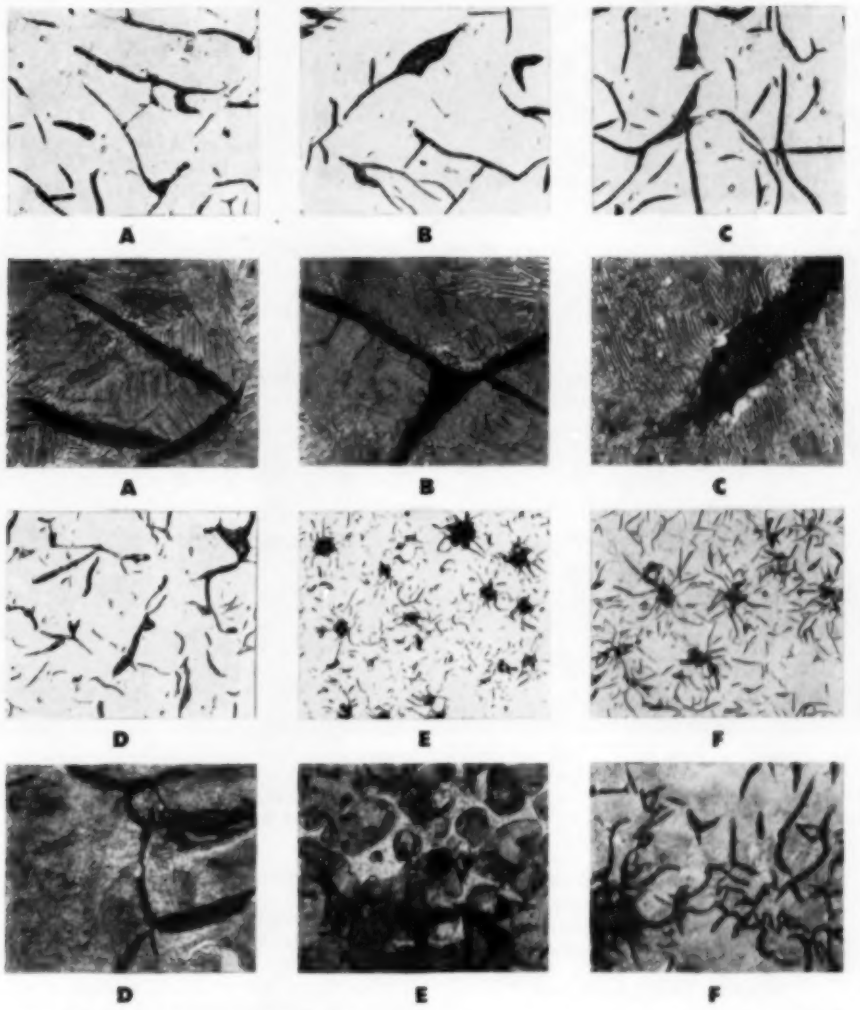
THE PETTER SMALL ENGINE DIVISION OF BRUSH ABOE, INC.
Office and Showroom 60-07 39th AVE, WOODSIDE, NEW YORK

50 to 90% Less Wear

on Rings and Cylinders with

DaRoS Piston Rings

Only DaRoS Piston Rings Come in These Many Different Metallurgical Structures!



UPPER micro-photographs "A, B, C, D, E, F" show texture of some of DaRoS Metals—unetched—magnified 100 times. LOWER micro-photographs "A, B, C, D, E, F" are the *same* DaRoS Metals as shown above—etched—2% natal—magnified 500 times.

IMMEDIATE Delivery from Chicago on Popular Ring Sizes for Industrial Engines

DaRoS AMERICAN CORPORATION

D. D. COOK, *President*

8128 N. Lawndale Avenue

Skokie (Suburb of Chicago), Illinois U.S.A.

Distributors for North, Central and South America

HERE'S WHY DaRoS PISTON RINGS REDUCE WEAR ON RINGS AND CYLINDERS

- DaRoS Rings are made of Swedish Iron Ore—world-famous for its high purity.
- No outside or "foreign" scrap metal is used in making DaRoS Castings.
- Only powdered charcoal fuel is used by DaRoS to "fire" their rotary furnaces.
- Laboratory tests made of every furnace charge assures complete uniformity of all castings and finished products.

- The high graphitic content—unifromly distributed is indicated by the black areas in the micro-photographs of DaRoS' metals shown on the left.
- DaRoS Iron Hardness: DRUM Castings—170 to 240 Brinell. INDIVIDUAL Castings—230 to 290 Brinell.
- DaRoS Iron Tensile Strength: DRUM Castings—34,000 PSI to 37,000 PSI MINIMUM. INDIVIDUAL Castings—37,000 PSI to 44,000 PSI MINIMUM.

Hardness and tensile strengths vary with rings sizes and type of castings used.

(This is the third ad of a series designed to bring to Diesel Operators in the Western Hemisphere the important story about DaRoS Swedish Iron Rings made by Ab Davy Robertsons Maskinfabrik of Gothenburg, Sweden.)

DaRoS American Corporation
8128 N. Lawndale Ave., Skokie, Illinois
Gentlemen: Send me complete information on DaRoS Rings.

NAME_____

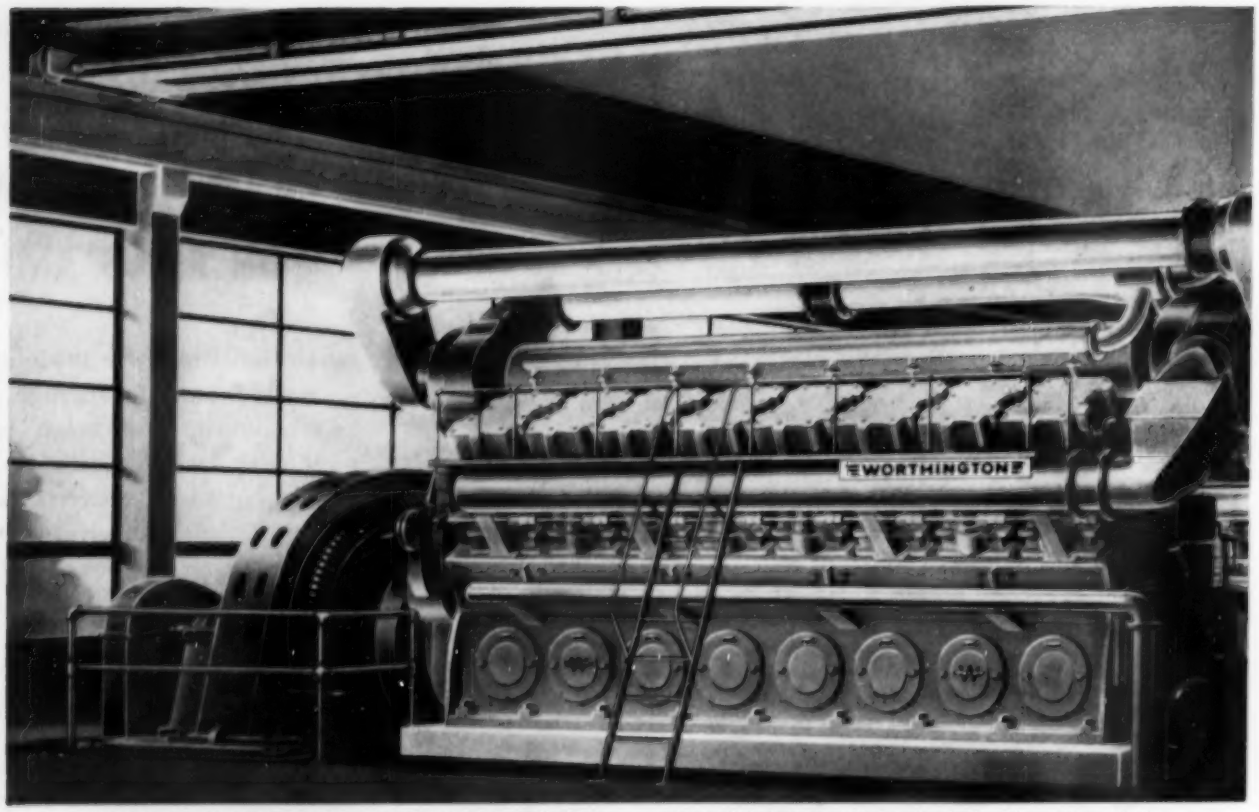
FIRM NAME_____

STREET ADDRESS_____

CITY_____ STATE_____

First U.S. high-output

...designed throughout for



NEW SW14 SIXTEEN-CYLINDER "VEE" ENGINE — built to deliver up to 5000 horsepower. All of the Worthington SW14's are ideal for power in: public and private electric central stations; water works; sewage disposal plants; irrigation and drainage projects; chemical and petroleum industries; oil and gas pipeline service; industrials; dredges; mining, quarry and cement plants; radio and radar stations. Economical operation on low-cost fuels.

"Way ahead of the field" is the way engineers seeing Worthington's new SW14 sum up their feelings about it. Here's why:

It's designed for outputs much higher than rated!

The only low-speed, heavy-duty U.S. engine *specifically designed and built* for high-output turbocharging, the SW14 is smaller and weighs less than its predecessors — with correspondingly lower foundation and installation expense. And its increased volumetric efficiency and cooling permit greater quantities of fuel to be economically burned . . . for higher power output.

Built-in Turbocharging!

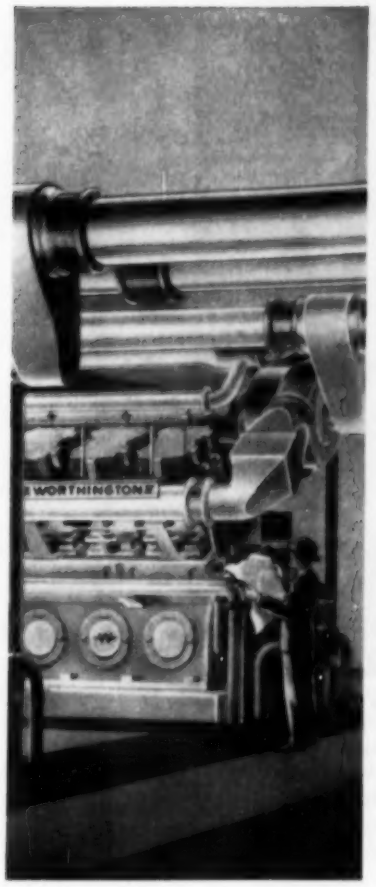
Every size of the SW14 (1350 to 5000 hp) uses the high-pressure type of turbocharger which develops higher discharge air pressure to provide optimum air-excess ratio. Turbo-blower aftercooling increases the density of the air charge — giving improved efficiency with lower initial cycle temperatures.

Fuel costs go down!

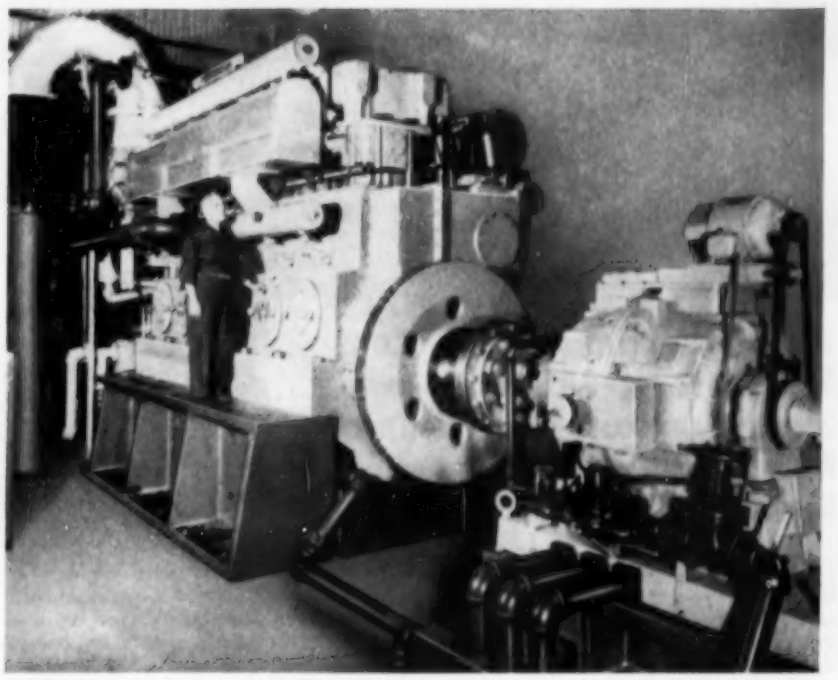
Designed from the base up for heavy power loads, the SW14 operates on the lowest cost fuels — residual, crude and distillate oils, as well as natural, sewage, propane, or manufactured gas. You can get it as an oil Diesel, dual-fuel Diesel or spark-ignition engine. And it's got all the exclusive features that have made other Worthington engines so popular — dual-plunger fuel pumps, automatic thermal air control, micro-metering gas valves, self-aligning exhaust valve seat inserts, and hydraulic valve lifters.

turbocharged engine

extra high-power service



WORTHINGTON ANNOUNCES THE SW14—
first major engine design advance in twenty years



SW14 SIX-CYLINDER IN-LINE ENGINE ON TEST at Worthington in 1954. This streamlined, rugged engine is the first in this country designed from the start for turbocharged high-power operation.

Rugged Dependability!

Important examples of the type of conservative engineering that went into the SW14 are the oversized crankshaft bedded in the engine base, cylinder liners with integrally-cast water jackets and controlled piston and head cooling. Result: always economical, continuous power.

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MISSOURI 60 WINS DIESEL PROGRESS CONTEST

By REX W. WADMAN

THE M & A Electric Power Cooperative, Green Forest Plant, Poplar Bluff, Missouri Wins The Bronze Plaque for 1954, Which is Annually Presented by DIESEL PROGRESS to The Most Efficient Internal Combustion Engine Generating Plant in The R. E. A. Family.

In 1950 DIESEL PROGRESS initiated, through the active cooperation of the Rural Electrification Administration in Washington, a contest to find out the most efficiently operated R. E. A. internal combustion engine plant. A special bronze plaque was to be awarded each year to the winning plant starting with 1951. For that year, the first of the contest, the prize was won by The Graham County Electric Co-op, Pima, Arizona. In 1952 it was won by the Wolverine Electric Cooperative at Big Rapids, Michigan, with the Missouri 60 running second. In 1953 Wolverine Electric Cooperative won it again and for the second year in a row, Missouri 60 was second. In 1954 Missouri 60 moved out of second place into first as indicated by the two tables hereunder.

Our hearty congratulations are extended to the Green Forest plant of the M and A Electric Power Cooperative at Poplar Bluff, Missouri, which consistently for the past three years has been fighting for top position in this closely fought contest and has now won. It will be our pleasure to present to James W. Owens, Jr., the Manager of Missouri 60, the DIESEL PROGRESS Plaque on Monday afternoon, May 2 at Denver, Colorado during the R. E. A. Electric Generating Plants' sixth annual operations and maintenance conference.

On the following pages we are describing in detail the winning plant, as we always do each year, and on those pages you will find full information on the engines installed and the accessory equipment which went along to contribute to the fine over-all operating record.

In arriving at the final figures which brought Missouri 60 to the top, we tabulated pertinent data such as size of plants, gross kilowatt hours generated; the percentage of station service; plant factor percentage; fuel costs; BTU content of fuel used per kwh; hp hours per gallon of lube oil; labor costs including operators, maintenance and material, which gave us a kwh total. We did not include fixed charges such as depreciation, interest, taxes, insurance or administrative overhead costs.

Because of the large variations in the cost of fuel, whether it be oil or natural gas, in the various R. E. A. plants throughout the country it was decided before the contest was started back in 1950, that low fuel cost would be one of the larger factors affecting production expense, and inasmuch as the local cost of fuel had little or no bearing on the over-all efficiency of plant operation, all final costs have been calculated on the basis of a uniform 50 cents per million BTU for all plants.

Taking all of the items mentioned above, with the exception of leveling the fuel cost, here is how the first five plants showed up for 1954.

1.	Missouri 60 Poplar Bluff plant	4.45 mills/net kwh
2.	Oklahoma 32 Woodward plant	4.56 mills/net kwh
3.	Kansas 34 Great Bend plant	4.58 mills/net kwh
4.	New Mexico 23 Lovington plant	4.613 mills/net kwh
*5.	Michigan 46 Hersey plant	5.05 mills/net kwh
6.	Kansas 51 Scott City plant	5.05 mills/net kwh

Now when we apply the fuel leveling measure of 50 cents per million BTU for all plants, the result of this adjustment brings about the following result insofar as the lowest production expenses are concerned.

*1.	Michigan 46 Hersey plant	6.067 mills/net kwh
2.	Missouri 60 Poplar Bluff plant	6.162 mills/net kwh
3.	Minnesota 37 Jackson plant	7.433 mills/net kwh
4.	Kansas 51 Scott City plant	7.434 mills/net kwh
5.	Kansas 34 Great Bend plant	7.609 mills/net kwh
6.	New Mexico 23 Lovington plant	7.725 mills/net kwh

*The Michigan 46 Hersey plant, which won the contest in 1952 and again in 1953, withdrew from the competition for the year of 1954.

It is obvious from reading these figures that the contest was again a very close one and the race came right down almost to the finish line. All six of these plants are to be heartily congratulated on a fine showing for 1954, and again we extend our hearty congratulations to Missouri 60, who were beginning to think they were a bridesmaid but never a bride. As you will see by reading the following eight pages, it's a great plant, well-equipped, well run, a credit to the M and A Electric Power Cooperative and to the Rural Electrification Administration. We take pride and pleasure in being privileged to donate this bronze DIESEL PROGRESS plaque each year to the most efficiently operated Rural Electrification Administration internal combustion generating plant.

We hope and feel that it is contributing to the spirit of competition which is so helpful in increasing the over-all economy and efficiency of the R. E. A. internal combustion plants.

POPLAR BLUFF, MISSOURI WINS DIESEL PROGRESS EFFICIENCY AWARD

By WILLIAM H. GOTTLIEB

THE M & A Electric Power Cooperative has won the DIESEL PROGRESS award for the best-operated internal-combustion REA plant in the nation in 1954. This distinction went to the Cooperative's Green Forest Generating Plant near Poplar Bluff, Missouri, a highly flexible power producer that was operated near (and often above) rated capacity throughout the year.

Four identical Cooper-Bessemer engines, each rated at 3300 hp, were in service from 5990 hours to 7121 hours during the year. They produced a combined total of 58,945,000 kw/hrs. In order to meet consumer demand, all four engines carried an overload as much as 18 hours a day, every weekday, month after month.

But output volume is by no means the major distinction of this plant. Primarily, it is notable for the planned efficiency of its operation,—a determination on the part of Manager James W. Owens, Jr., Plant Superintendent Howard W. Clutts, and every member of the operating staff to get peak performance from their equipment. The plant is recognized of course, for production economy, as the DIESEL PROGRESS award attests, and achieved a total production cost, including overhead, of just 6.41 mills per net kw/hr.

It is notable also as the first installation of Cooper-Bessemer's three-way engines which operate with diesel-cycle efficiency as a straight oil-burning engine, as a dual-fuel engine using natural gas with oil as a pilot fuel, and finally as an electric-ignition straight gas engine. This provides a high degree of flexibility and permits M & A's prudent management to utilize the most advantageous fuel at all times. Natural gas is the cheapest fuel and is used with electric ignition in two of the engines during the six months of the year when supplies are most certain. The other two engines function as dual-fuel units during this period, sacrificing a little in fuel cost for the protection against failure of the gas supply. Then, when cold weather approaches, giving the supplier the contractual right to cut the plant off the gas line, the two gas engines are converted to dual-fuel. The prudence of this practice was demonstrated seven times in the year 1954 when gas supply was shut off for periods ranging from 24 to 60 hours and the four diesels operated wholly on oil. We'll talk about the mechanics and economics of this operation a little later, but first we want to describe the organization that runs the prize plant.

M & A Electric Power Cooperative Inc., came into being May 17, 1948 for the purpose of generating and transmitting electric energy to nine member distribution cooperatives in southeastern Missouri and northeastern Arkansas. Subsequently, two of the Arkansas co-ops withdrew, one obtaining adequate power supply from Norfolk Dam and the other concluding a satisfactory utility contract. The remaining seven (five in Missouri and two in Arkansas) either could not obtain an adequate supply or felt that prevailing rates were excessive. The Green Forest Generating Plant was put into service August 12, 1951, to provide a dependable and economical power source.

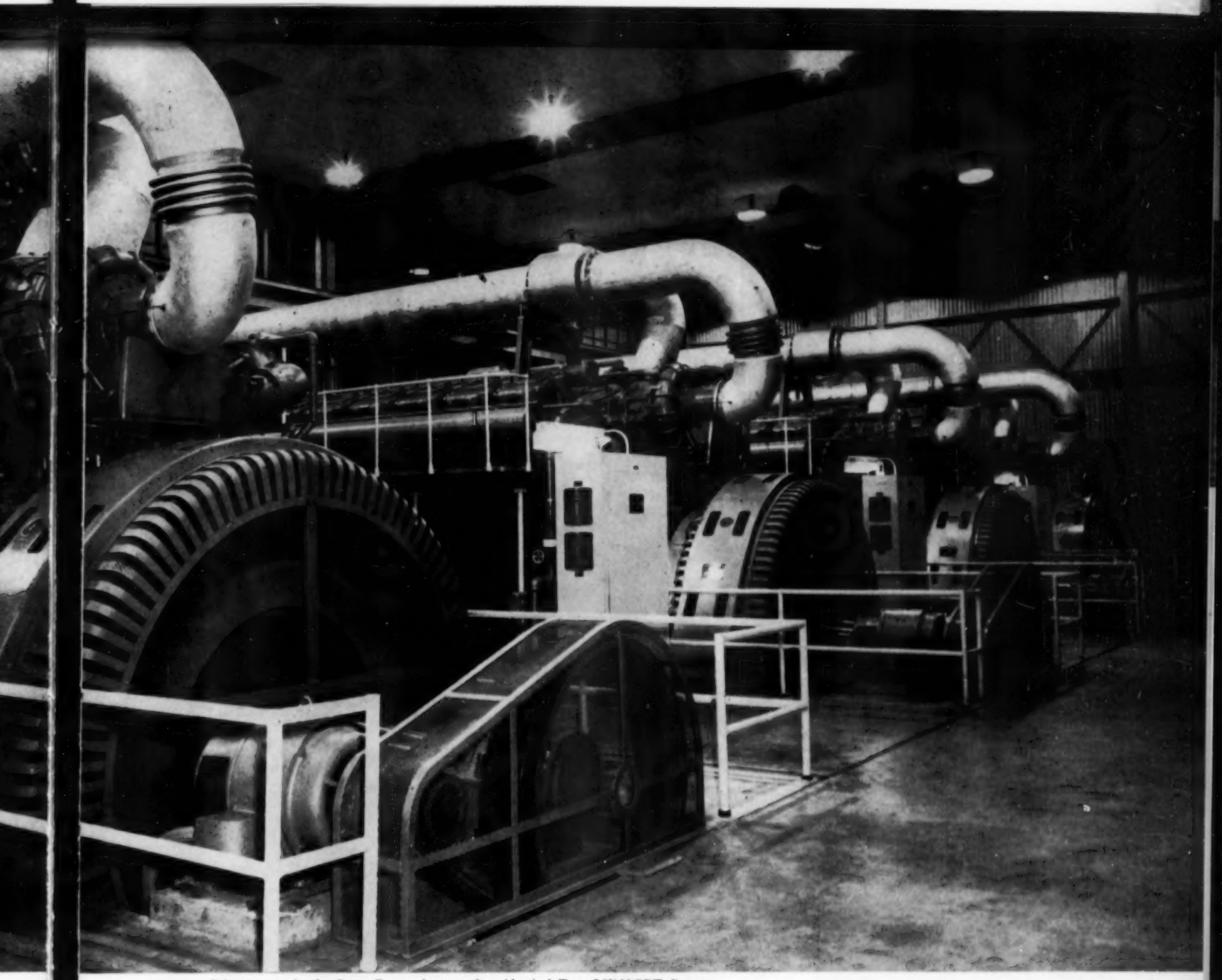
Today, existing generating facilities and transmission lines permit service to just three of the seven cooperatives: Ozark Border Electric Co-op., Poplar Bluff, Mo., Scott-New Madrid-Mississippi Electric Co-op., Sikeston, Mo., and Black River Electric Co-op., Ironton, Mo. M & A delivers power over 227 miles of line to 14 load centers at 69 kv, puts the electricity through transformers with total capacity of 18,500 kva, and supplies the member cooperatives at 7.2 kv on the low side of the substations. The members, in turn, serve 30,000 consumers over 7120 miles of energized line.

The power cooperative has applications on file for funds to provide additional generating and transmission facilities to permit service to the remaining distribution cooperatives; Craighead Electric Cooperative Corp., Jonesboro, Ark., Clay County Electric Cooperative Corp., Corning, Ark., Pemiscot-Dunklin Electric Coop., Hayti, Mo., and Howell Oregon Electric Coop., West Plains, Mo. Even the three members now served have developed greater load than the Green Forest plant can carry. Four load centers in the western part of the system get power directly from the Norfolk and Bull Shoals Dams of the Southwestern Power Administration. M & A has contracted with SPA for an additional 2000 kw of maximum demand to supplement plant

output but this supply of hydro power has been limited by water shortage. Thus, although the plant was able to purchase 14,001,278 kw/hrs in 1954, the bulk of the demand had to be met by the four hard-working diesels, each of which produced more power than the total purchased.

In all, the engines produced 58,945,000 kw/hrs during the year on a fuel consumption of 550,989,000 cu. ft. of natural gas and 283,852 gal. of fuel oil. This means an average of 9.34 cu. ft. of gas and 0.0047 gal. of oil per kw/hr. In terms of heat value, (calculating on a basis of 139,400 btu per gal. of oil and the lower heating value of 964 btu per cu. ft. of gas) this fuel consumption represents 9004 btu of gas and 655 btu of oil for a total of 9659 btu per kw/hr. It should be remembered that we are talking about the average fuel consumption for a year that included three kinds of operation. It is a matter of interest to see how the three-way engines performed on each fuel and as a dual-fuel.

Table I shows that Engines 2 and 4 ran as straight



Prime movers in the Green Forest plant are four identical Type LSV-16-GDT Cooper Bessemer 5-way engines capable of running on oil, natural gas, or a combination of the two. Shown are Ideal Electric alternators and exciters, Woodward governors, Elliott superchargers, Air-Maze silencers, and Zallea flexible exhaust connectors.

gas engines for the six-month period from June through November. In that period, they produced 17,187,000 kw/hr on 177,745 mcf of natural gas, an average consumption of 10.34 cu. ft. or 9,968 btu per kw/hr. It can be assumed that the other two engines functioned as dual-fuel units during these months, generating 17,150,000 kw/hr on a fuel consumption of 154,747 mcf of gas and 96,502 gal. of oil. This represents an average of 9.02 cu. ft. of gas and 0.0056 gal. of pilot oil per kw/hr. Expressed in heat units, it is 8,695 btu of gas and 781 btu of oil for a total of 9,476 btu per kw/hr.

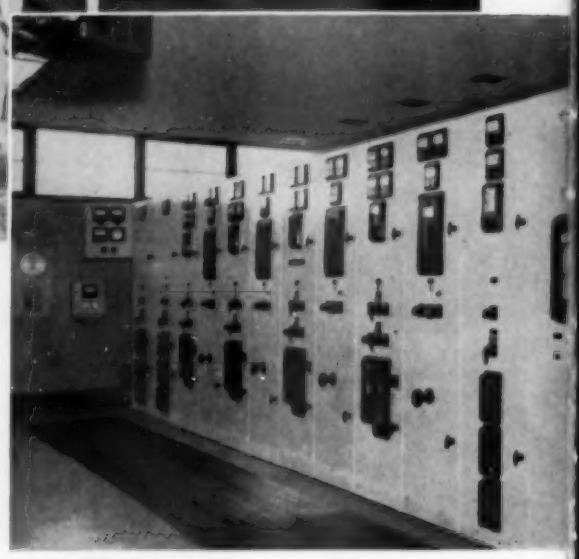
Since the isolated cases of full oil operation do not loom large in the fuel economics of the plant, no effort has been made to compile precise figures on power production volume and efficiency during the periods that gas is unavailable. Tests have been run, however, to determine full diesel fuel consumption and showed all engines near 0.470 lb. per kw/hr at full load. It should be emphasized that no fuel saving is too small to rate attention from M & A management. Mr. Ownes has initiated discussions with the gas company in an effort to reduce the number of gas cut-offs.

Heat efficiency has basic importance but it is not the determining factor in choice of fuel at Green Forest. Natural gas at an average rate of $.2881 per mcf in 1954 is the cheapest fuel the plant can use; straight fuel oil at $.1003 per gal. is the most expensive. Thus, full gas operation with electric ignition permitted the low fuel cost of 2.98 mills per kw/hr. Dual-fuel operation with gas and pilot oil cost 3.16 mills. On the basis of the test results cited, diesel oil operation cost more than 6.8 mills. By switching the two engines to full gas for six months, the plant saved more than $3,000.00, compared with the cost of comparable production while on dual-fuel.

It was the full cost computation of net energy generated that won the DIESEL PROGRESS award for M & A. For the full year, operation, supervision and engineering, station labor, fuel oil and gas, lubricating oil, operating supplies, and maintenance of plant and equipment cost a total of $253,693.89. With net generation at 57,049,300 kw/hr, the average production expense was 4.45 mills per kw/hr. To this were added such overhead items as depreciation, taxes, interest, insurance and other administrative and general expenses totaling $112,180.68 or 1.97 mills. This brought the total production cost per kw/hr to 6.41 mills. Table II gives the itemized costs. These are the actual costs as reported to REA. For purposes of the competition, fuel prices were equalized for all the competing plants.

Let's take a closer look at the prize plant. The four engines are Type LSV-16-GDT/SG Cooper-Besse-

M & A Manager James W. Owens, Jr., (right) discusses engine performance with his plant superintendent, Howard W. Clutts.



Westinghouse built the switchboard, meters and relays, and switchgear. On the board are Micromax totalizing wattmeters, Leeds-Northrup recording voltmeter, and Westinghouse Silverstad voltage regulator.

mers, a 16-cylinder, V-type, supercharged unit of 15½-in. bore and 22-in. stroke, conservatively rated for this installation at 3300 hp at 327 rpm. This rating is at a specified bmep of 120 psig. The same engine has operated successfully at a bmep of 150 psig, which gives it a rating of 4120 hp at the same 327 rpm. Each engine drives a 2939 kva, 2351 kw, 3-phase, 60-cycle, 4160 volt Ideal Electric alternator with 30 kw, 125-volt exciter.

The plant is fortunate in having a natural gas pipe line just a quarter mile to the West. A 6-in. line brings gas at 50 psig to the plant through a master meter into a header and then to four individual meters that record flow and pressure. The gas pressure is reduced to about 18 psig by a regulator, after which the gas flows to a small expansion tank, then through a check valve to the main regulator on the engine, then to the individual admission valves at each cylinder. When the engines are to be run on straight gas, fuel nozzles are removed from each cylinder and spark plugs inserted, a conversion job that takes about two hours. A special automatic ignition and battery charging system has been provided. There is a rectifier for each engine and four 12-volt batteries that float on the dc ignition circuit.

For dual-fuel and straight diesel operation, M & A uses a No. 2 fuel oil delivered by truck and stored in four 50,000-gal. vertical steel tanks. There are heating coils for two of the tanks but use of the coils is not necessary with the present fuel. A pair of 20 gpm motor-driven rotary pumps transfer fuel from storage through a heat exchanger utilizing engine jacket water to warm the oil to two filters, each with nine disposable cellulose cartridges. The filters have electric heating elements as an alternative to the exchanger.

After filtration, fuel oil passes through individual piston-type meters to the 250-gal. day tanks located in the plant basement adjacent to the engine foundations. An automatic day-tank level control has been provided but the operators prefer to fill the tanks by manual control because the larger flow permits more accurate metering and also to give opportunity to read and record fuel temperature at the time the tank is filled. It is evident that these men want to know *exactly* how much fuel their engines are using.

A booster pump sends fuel from the day tank to a small pressure tank above the engine from which it flows through a duplex filter to a pressure regulator, then to the high pressure pump. Oil is accurately metered to the cylinders by the injectors. In dual-fuel operation, it would be possible to run with as little as 4% pilot oil, but M & A engineers prefer to use nozzle tips that result in a higher percentage of oil but facilitate full-load and overload operation on straight oil in the event that gas is shut off. Incidentally, switch-over from dual-fuel to oil is automatic and instantaneous if the gas supply fails.

A detergent-type lubricating oil is purchased in tank-car lots and stored in a 9000-gal. underground tank. A 10 gpm pump transfers makeup lube as needed through a meter to the individual engine sump tanks. Lube oil is circulated through each engine by a 450 gpm pump driven by a 20 hp electric motor through reduction gears. Included in the full-flow system are a duplex and a shell-and-tube oil cooler. Oil temperature is kept at prescribed temperature automatically by motor-operated butterfly valves which bypass spray water around the cooler as necessary. The valve operation in turn is controlled by a potentiometer on a gauge and operating panel beside each engine; thus lube

TABLE I
M & A

1954 Month Ended 20th of	Gross Kilowatt-Hrs Generated					Fuel Gas Consumed (MCA)					Fuel Oil Consumed (Gal.)				
	Eng. #1	Eng. # 2	Eng. #3	Eng. #4	Total	Eng. #1	Eng. # 2	Eng. #3	Eng. #4	Total	Eng. #1	Eng. #2	Eng. #3	Eng. #4	Total
Jan.	1,453,000	572,000	938,000	655,000	3,618,000	12,078	4,503	6,881	4,731	28,193	19,218	8,466	18,387	10,389	56,460
Feb.	1,007,000	899,000	1,224,000	609,000	3,739,000	8,875	7,923	10,627	5,213	32,738	7,794	7,420	10,955	4,452	30,621
Mar.	821,000	911,000	800,000	881,000	3,413,000	7,901	8,329	7,151	7,950	31,331	4,157	4,360	5,014	4,278	17,809
Apr.	1,203,000	1,164,000	1,140,000	1,137,000	4,644,000	11,504	10,657	10,017	10,321	42,499	6,140	5,533	6,927	5,373	23,973
May	1,215,000	1,043,000	1,337,000	1,128,000	4,723,000	11,960	9,739	11,754	10,737	44,190	3,682	4,762	8,106	3,815	20,365
June	1,356,000	1,447,000	1,315,000	1,481,000	5,599,000	12,645	15,139	11,517	15,429	54,730	6,910	None	7,891	None	14,801
July	1,586,000	1,600,000	1,514,000	1,609,000	6,309,000	14,848	16,433	13,153	16,576	61,010	7,573	None	8,521	None	16,094
Aug.	1,667,000	1,495,000	1,443,000	1,555,000	6,160,000	15,353	15,448	12,655	16,136	59,592	8,691	None	8,135	None	16,826
Sept.	1,552,000	1,514,000	1,584,000	1,097,000	5,747,000	14,483	15,757	14,093	11,496	55,829	8,258	None	8,962	None	17,220
Oct.	1,430,000	1,268,000	1,013,000	1,488,000	5,199,000	12,859	12,998	8,992	15,238	50,087	8,236	None	6,197	None	14,433
Nov.	1,534,000	1,071,000	1,156,000	1,562,000	5,323,000	13,660	11,079	10,489	16,016	51,244	9,138	None	6,990	None	16,128
Dec.	1,287,000	1,112,000	932,000	1,140,000	4,471,000	10,739	9,553	7,856	11,398	39,546	13,505	11,460	11,969	2,388	39,122
Total	16,111,000	14,096,000	14,396,000	14,342,000	58,945,000	146,905	137,558	125,185	141,241	550,989	103,102	42,001	108,054	30,695	283,852

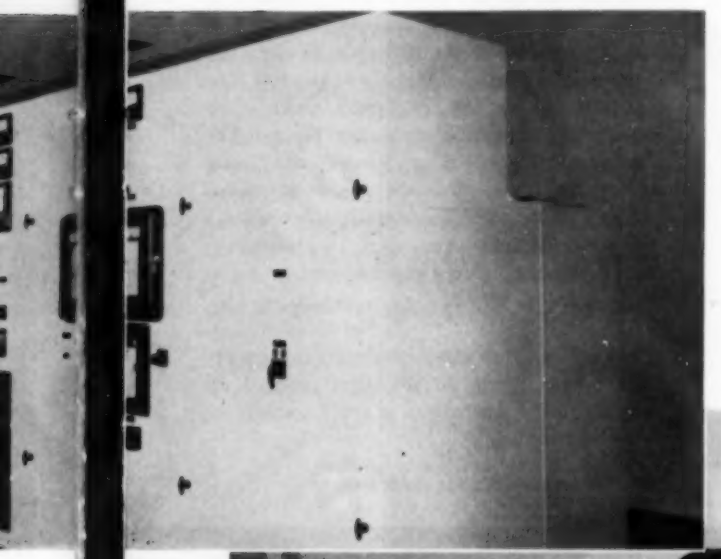
temperature can be set and maintained from the control panel.

Every effort has been made to keep lube in excellent condition. Part of the oil is bypassed from the pressure system through an 18-cartridge cellulose-packed filter equipped with electric heater and back to the sump. Even when the engine is not in service, continuous circulation of oil through the filter can be maintained with a 35 gpm motor-driven pump which takes oil from the sump and returns it to the sump after filtration. In addition, there is a lube oil conditioner which includes a heater, a cartridge-type cellulose filter, and a vacuum vaporizer to eliminate dilution. By means of a motor-driven pump and a battery of three-way valves, it is possible to take oil from any engine sump tank, condition it and return it to the sump whether an engine is idle or in operation. In the event of serious dilution, all the oil can be pumped from a sump into a used-oil tank, put through the conditioner and stored in a clean-oil tank. Meanwhile, the engine would be supplied immediately with a previously-treated batch of oil from the clean-oil tank or with new oil from storage and returned to service.

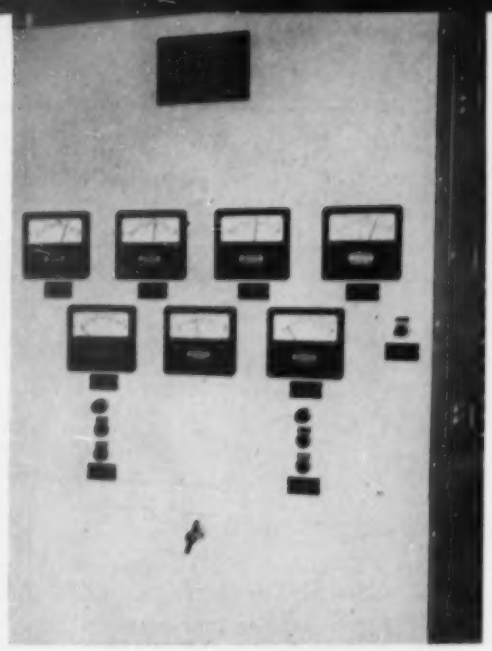
The oil is tested every 600 hours with a test kit to determine viscosity, acidity, water and bottom sediment, and carbonaceous material. Every three months, a sample is sent for thorough laboratory examination by the oil company. The oil invariably is reported to be in very good condition.

Cooling water for each engine is circulated through engine jackets and a shell-and-tube heat exchanger by an 830 gpm centrifugal pump driven by a 15 hp motor. Piping is arranged so that any pump can serve any engine. Another four 830 gpm centrifugals, driven in this case by 20 hp motors, send spray water from the cooling tower sump through the lube coolers and jacket water heat exchangers to the sprays of a forced-draft cooling tower built in two sections which can be operated independently. Each tower section has a 6-blade 144-in. fan driven by a 20 hp 2-speed motor.

Temperature control is flexible and convenient. In response to a potentiometer setting on the panel near the engine, motor-operated butterfly valves bypass spray water around the heat exchanger to maintain jacket water at the prescribed temperature. The tower fans can be started, run at either speed or stopped from push-button controls in the engine room. As many of the raw water pumps can

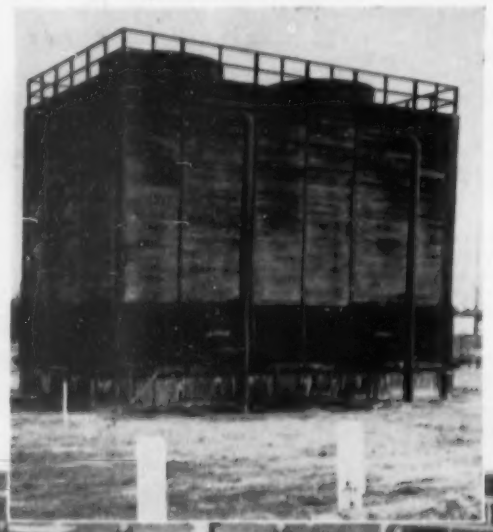


Attending a meeting of the Board of Directors were: seated, left to right: a visitor, James M. Stephenson, manager, Black River Electric Co-op, Ironton, Mo., Ansel I. Moore, secretary; Elon Proffer, president; J. E. Perringer, another visitor, president of the Black River Co-op; Frank Paullus, director; Ray Creek, treasurer; L. L. Bryan, director. Standing, left to right: James W. Owens, Jr., manager, and Harold Treasure, attorney. Absent: Earl Walden, vice president, and O. A. Knight, director.



Cooper-Bessemer designed, and Moorehead Electric built, the lube oil control panel. It holds Junior Liquidometers for lube sumps, storage tanks, and used- and clean-oil tanks. There are push-button controls for lube oil transfer pumps.

Lille-Hoffman forced-draft cooling tower is constructed in two sections which can be operated independently. Each section has a 6-blade, 144-in., Aerovent fan, driven by a 20 hp, 2-speed Ideal Electric motor.



M & A TABLE II
Cost of Net Energy Generated 1954

	Total $	Mills Net Kwh
Operation, Supervision and Engineering	3,658.31	—
Station Labor	34,665.63	.61
Fuel, Oil	28,476.14	.50
Fuel, Gas	158,736.00	2.78
Lubricating Oil	5,791.28	.10
Other Operating Supplies and Expenses	9,699.58	—
Maintenance, Supervision and Engineering	1,712.71	—
Maintenance, Structures and Improvements, Labor	302.00	—
Maintenance, Structures and Improvements, Material	49.48	—
Maintenance, Generating and Electrical Equipment, Labor	6,375.51	—
Maintenance, Generating and Electrical Equipment, Material	4,227.25	—
TOTAL PRODUCTION EXPENSE	253,693.89	4.45
(Overhead Costs, Prorated)		
Depreciation	46,962.23	—
Taxes	3,262.25	—
Interest	33,839.12	—
Insurance	4,993.23	—
Other Administrative and General	23,123.15	—
TOTAL OVERHEAD COSTS	112,180.68	1.97
TOTAL PRODUCTION COSTS	365,874.57	6.41

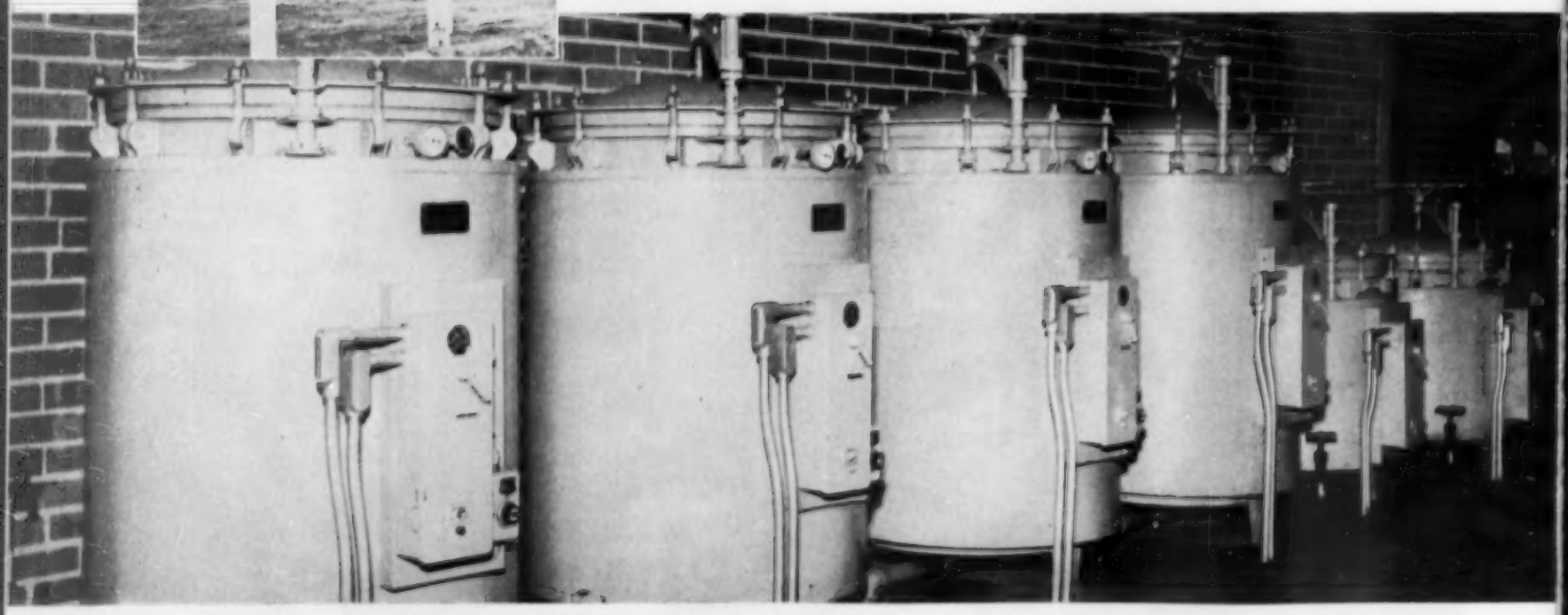
be pressed into service as the cooling load requires, again from controls in the engine room.

Makeup water for the cooling system is provided by two motor-driven deep-well pumps which discharge through a meter into a 3000-gal. tank which is kept at 70 lb. pressure. From this pressure tank, makeup water is admitted to the tower sump as needed through float-controlled valves. Water treating chemicals are added to the spray water by proportioning pumps. Makeup for the jacket supply is treated in a zeolite-type softener and is then metered.

Air for these four-cycle engines is drawn through self-cleaning filters outside the plant. From each filter, air enters the plant through a single line which then splits into two branches with an intake in-line silencer in each branch. Each branch delivers air to an exhaust-driven supercharger which sends the air through an aftercooler into the intake header serving a bank of eight cylinders. The aftercoolers are cooled with spray water at its coolest, direct from the circulating pumps. The superchargers themselves are cooled with jacket water. Jacket water from the engine discharges through a jet, the suction side of which is the water discharge from the superchargers, thus increasing flow of water through the superchargers by means of syphon action.

Ambient temperatures are high during the summer months. Tests conducted in August showed air going into the superchargers at 104°f, coming out

Lube oil from each of the engines is by-passed through one of the four 18-cartridge Hoffman cellulose-packed filters. At right are two 9-cartridge Hoffman cellulose filters used to clean the fuel oil.



Manager James W. Owens, Jr., confers on operating plans with plant executives. Left to right are: S. Joseph Marek, agricultural engineer; Mr. Owens; Howard W. Clutts, plant superintendent; B. A. Ellis, office manager. Casey H. Forbes, transmission superintendent, was not present when picture was made.

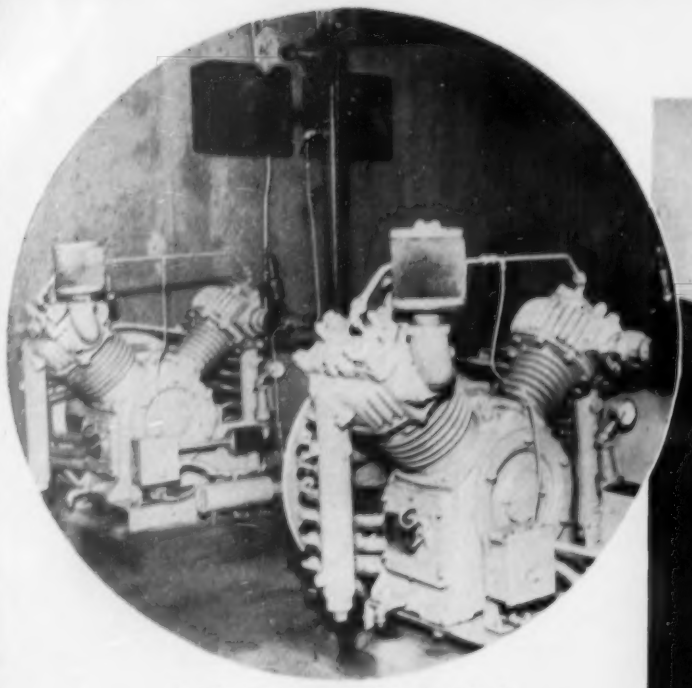
at 154° to enter the aftercooler, then out to the header at 134°. July and August are the peak production months and the engines comfortably carried an over-load on the hottest days. In winter, the aftercoolers serve to raise air temperature. After leaving the superchargers, the exhaust gases vent through vertical silencers at the rear of the plant. Starting air for the engines is supplied by a pair of vertical air compressors belted to 15 hp motors. Air in the header and the four storage tanks is kept automatically at 250 psig.

Gauge, meters and controls are arranged so that the operator can check operating conditions and control accessory equipment without leaving the engine room and the adjacent switchboard room. Beside each engine is a panel holding pressure gauges on jacket water, lube, gas, turbocharger lube, fuel, starting air, engine air, alarms on water, gas, lube and fuel pressure, water and lube temperature, fuel day tank level; push button controls for air filter, lube pump, fuel booster pump, jacket water pump, lube filter pump and lube filter heaters. There is also an exhaust pyrometer with selector switch, a voltmeter and ammeter on the ignition system and an ignition voltage test button. We have mentioned before the potentiometers for controlling lube and water temperatures.

A station panel holds gauges on starting air, gas pressure, fuel transfer pressure, spray water pressure and temperature; and alarms on starting air pressure, water softener regeneration, fuel and lube filter recharge, fuel transfer pressure and gas pressure. There are controls on this panel for the fuel transfer pumps, fuel filter heaters, tower fans, spray water pumps and air compressors. Finally, there is a lube control panel with level meters for the sump tanks, used- and clean-oil tanks, and the lube storage tank. This panel has controls for the lube transfer pumps.

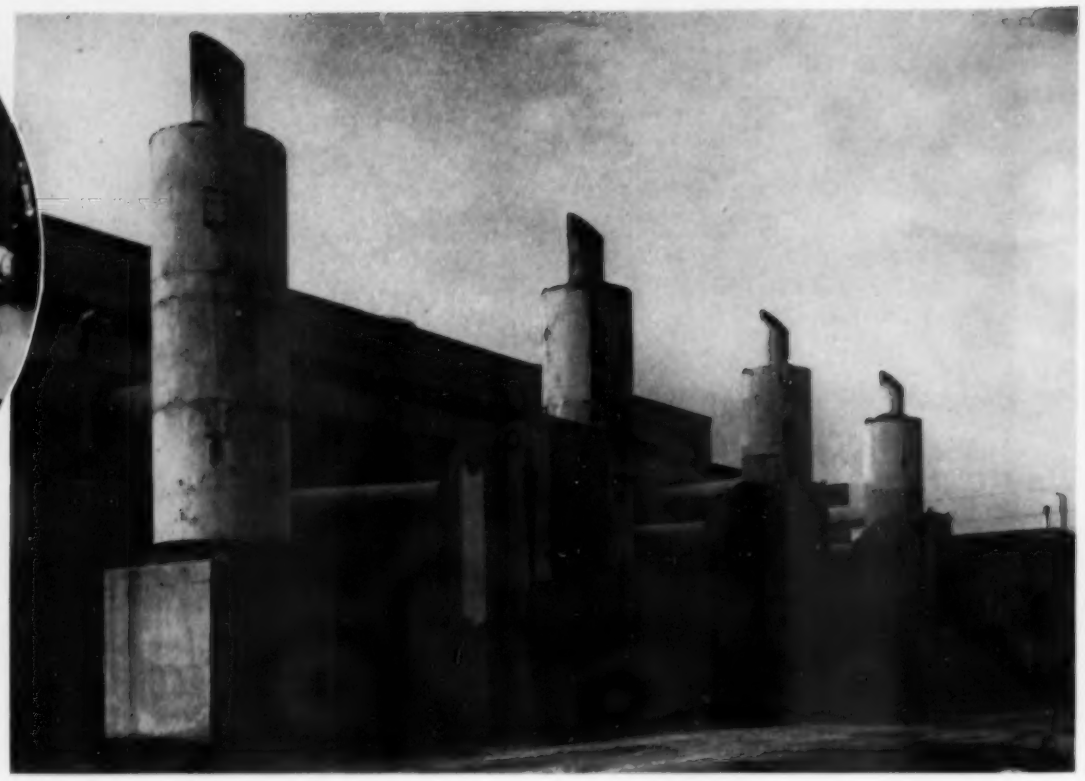
The same completeness of instrumentation is to be

The full operating staff of the Green Forest plant are, left to right: E. Singleton, John Marley, Ward Crabtree, Frank Anthony, Gene Wright, Howard Clutts, Frank Smody, Barnie Rommel, Roy Powers, Patrick Palmer, George Milner, Carter Ponder and Ollie Berry



Starting air is supplied by two Gardner-Denver compressors, V-belted to a 15 hp Ideal Electric motor. Pressure is maintained automatically with Allen Bradley controls.

Engine air is drawn through multi-duty, self-cleaning American Air filters. Exhaust gases vent through Maxim silencers.

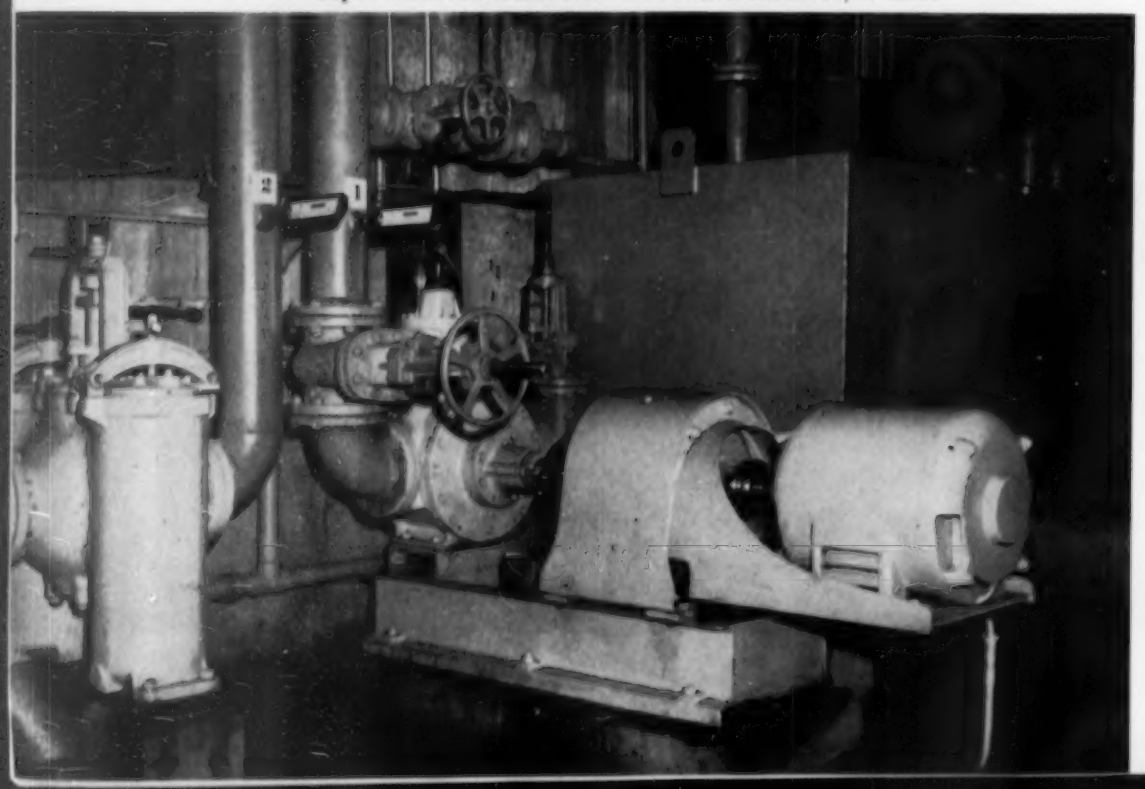


found at the switchboard with its two substation panels, eight generator panels, station power panel, totalizing panel and bus tie panel. At right angle are a meter panel and two transmission line control panels. The plant has a battery system for supply of governor controls, breakers, alarms, emergency lighting and holding coils on starters for fuel booster and lube pressure pumps. There is an automatic battery charger with a non-automatic charger in parallel. In emergency, the plant has the service of a 100 kw gasoline engine-generator set to provide power for lighting, fuel oil booster pumps, one air compressor and lube oil pressure pumps. Equipped with its own battery starting system, it can start up the plant from scratch. The emergency unit is connected to the engine station power circuit through interlocking switches.

M & A engineers know that good operating is just as important as good equipment and have organized a meticulous preventive maintenance program. The schedule book lists the parts and equipment to be checked and the interval between servicings. To pick just a few at random: air filters are checked at 1000 hours, governors at 4000 hours, main and connecting rod bearings at 6000 hours, lube pumps at 7000, cylinder liners at 8000, heat exchangers and aftercoolers at six months, lube filter pumps annually. The full list covers everything in the plant.

There is an individual card for each part or piece of equipment and notations are made of each job done and the condition of the equipment. In addition, the plant makes out an "out of service report" when a major piece of equipment is taken out of service for maintenance. A copy indicating the job to be done is sent to the office when the equipment comes off the line and a second report with the same job number goes to the office when the repair is completed.

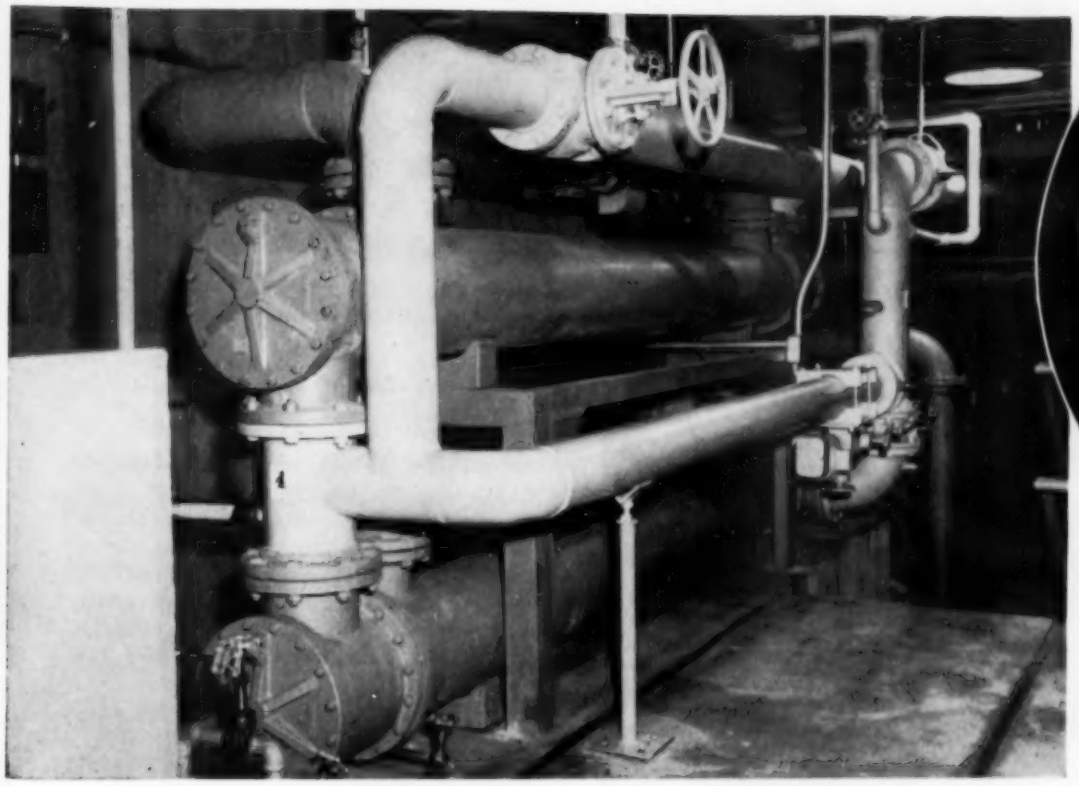
Lube oil from the sump tank at right is circulated through the engine by the 450 gpm Blackmer pump, driven by a 20 hp Ideal Electric motor. In the full-flow circuit is the duplex Andale lube strainer at the left. Thermometers are Taylor "Binoc."

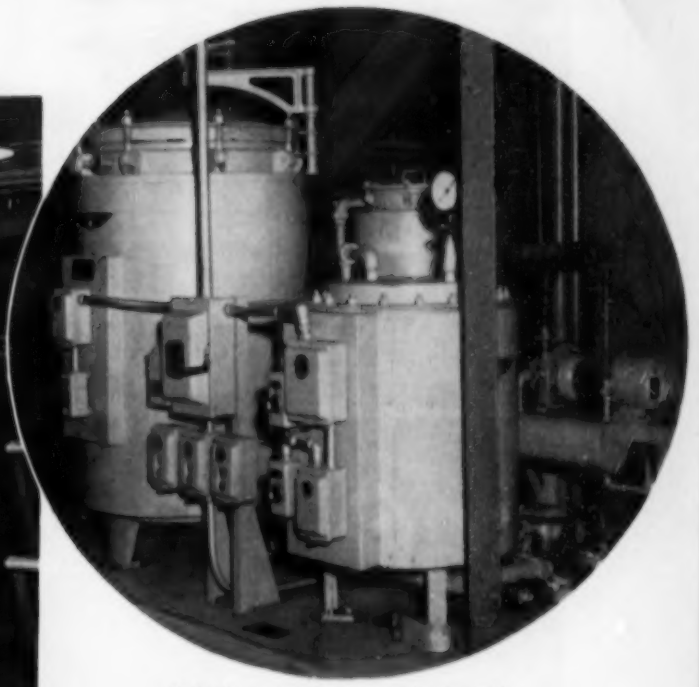


Demand on the plant has been so heavy that it has been difficult and in some cases impossible to take engines off the line for scheduled maintenance. A review of the log sheets for 1954 showed that from June 15th to the latter part of November, it was necessary to run three engines 24 hours a day and the fourth engine for 18 hours a day. In other words, each engine could be shut down for 6 hours once every fourth day. The load reached 10,000 kw virtually every weekday and often stayed at this over-load peak from 8 a.m. to 11 p.m. Even in winter, when loads are lighter, all four engines are needed to carry the peaks. In this situation, the first engine to get a major overhaul came off the line with 16,214 hours of service. Engine condition was reported to be good with average liner wear just .007 in.

M & A Manager Owens credits Plant Supt. Clutts, Chief Engineer Ponder and the plant operating staff with major responsibility for the efficient operation of the Green Forest plant. Also important in the success of the cooperative's program are B. A. Ellis, Office Manager; Casey H. Forbes, Transmission Superintendent; and S. Joseph Marek, Agricultural Engineer.

No organization could achieve M & A's success record without wise and energetic officials at the level of policy supervision. In the case of this REA cooperative, many of the present officers and directors were prime movers in the creation of the co-op and play vital roles in its continuing growth. The officers and directors are: President Elon Proffer, Matthews, Mo., Vice President Earl Walden, Jonesboro, Ark., Secretary Ansel I. Moore, Poplar Bluff, Mo., Treasurer Roy Creek, Corning, Ark.,





Lube from any engine can be treated continuously or batch cleaned in this Hoffman lube oil conditioner which incorporates a heater, cartridge-type filter and vacuum vaporizer.

Each engine has a Ross oil cooler and a Ross jacket water heat exchanger. The Automatic Temperature Control thermostatic bypass valve shows at the far end of the exchanger.

and Directors L. L. Bryan, Willow Springs, Mo., Frank Paullus of Coldwater, Mo., and O. A. Knight of Portageville, Mo. Consulting engineers in the design and construction of the plant were Stanley Engineering Co.

List of Equipment

Engines—Four type LSV-16-GDT-SG, 15½x22-in., 327 rpm, 3300 hp "three-way" engines. Cooper-Bessemer.

Alternators—Four Type SAN, 2939 kva, 2351 kw, 3 ph, 60-cycle, 4160 volt 80% pf. Ideal Electric.

Exciters—30 kw, 125 volt. Ideal Electric.

Governors—UG32 Woodward.

Fuel System

Fuel unloading pump—Blackmer.

Fuel meters—Pittsburgh Equitable.

Fuel transfer pumps—Blackmer.

Fuel filters—U. S. Hoffman.

Fuel heat exchanger—Kewanee-Ross.

Day tank float control—Fisher Governor.

Day tank level alarm—Mercoid.

Fuel filters on engines—Purolator (duplex).

Fuel pressure relief valves—Fisher.

Storage tank level meters—Tokheim.

Overflow fuel drain tank meter—Liquidometer.

Gas meters—Foxboro.

Pressure regulators—Fisher.

Piston rings—Pedrick and American Hammered.

Lubrication System

Lube oil—Dieselmotive Oil B, Gulf Refining.

Lube transfer pump—Blackmer.

Lube tank level gauges—Liquidometer.

Lube meters—Pittsburgh Equitable.

Main lube pumps—Blackmer.

Oil coolers—Kewanee-Ross.

Thermostatic control valves—Automatic Temperature Control.

Potentiometers—Foxboro.

Lube by-pass filters—Hoffman.

Lube full-flow strainers—Andale.

Lube oil test kit—Gerin.

Lube batch-bypass purifier—Hoffman.

Water System

Float control valves—Fisher.

Cooling tower—Lille-Hoffman.

Heat exchangers—Kewanee-Ross.

Thermostatic control valves—Automatic Temperature Control.

Potentiometers—Foxboro.

Air System

Air filters—Self-cleaning—American Air Filter.

Intake silencers—Air Maze.

Exhaust-driven turbochargers—Elliott.

Aftercoolers—Young Radiator.

Exhaust silencers—Maxim.

Starting air compressors—Gardner-Denver.

Air tanks—Scaife.

Electric Accessories

Switchboard—Westinghouse Electric.

Meters, relays, circuit breakers—Westinghouse.

Voltage regulators—Silverstat, Westinghouse.

Batteries—Exide Manchek.

Battery chargers—Rectox Rectomatic, Westinghouse.

Ignition system batteries—Exide.

Flexible exhaust connectors—Zallea Bros.

Emergency generating unit—LeRoi gasoline on 100 kw, Ideal Electric.

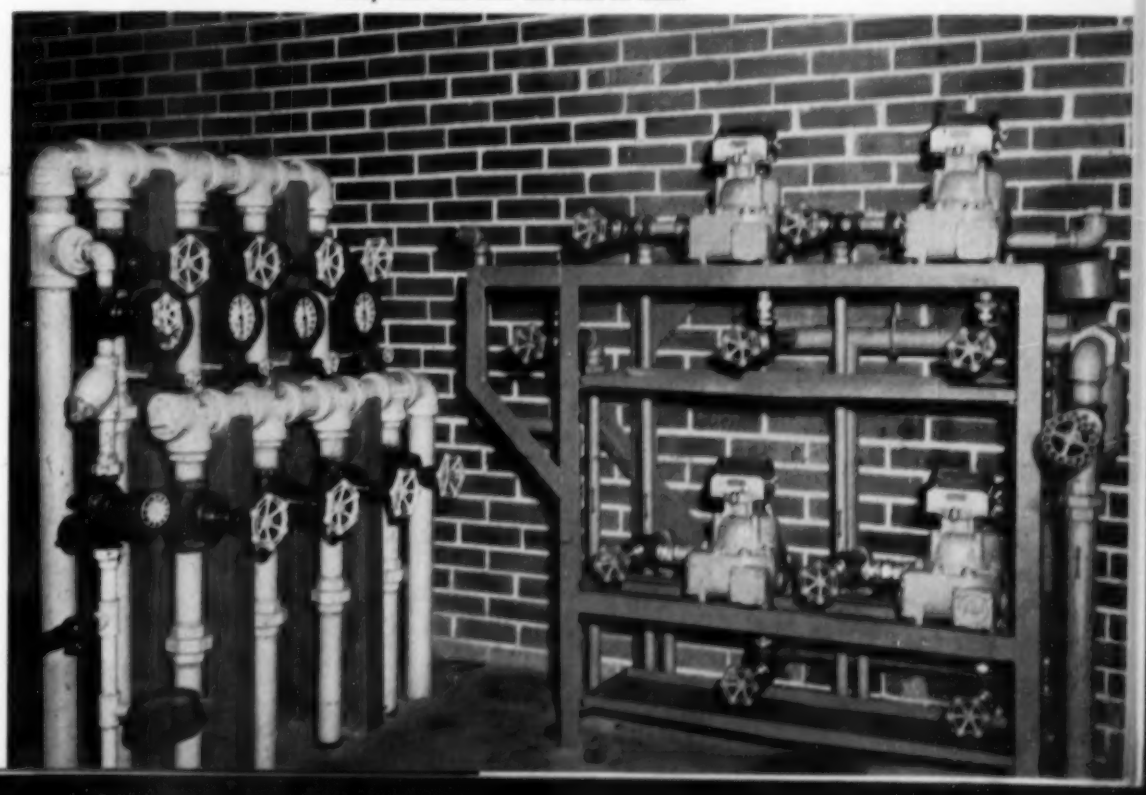
Generator—Ideal Electric.

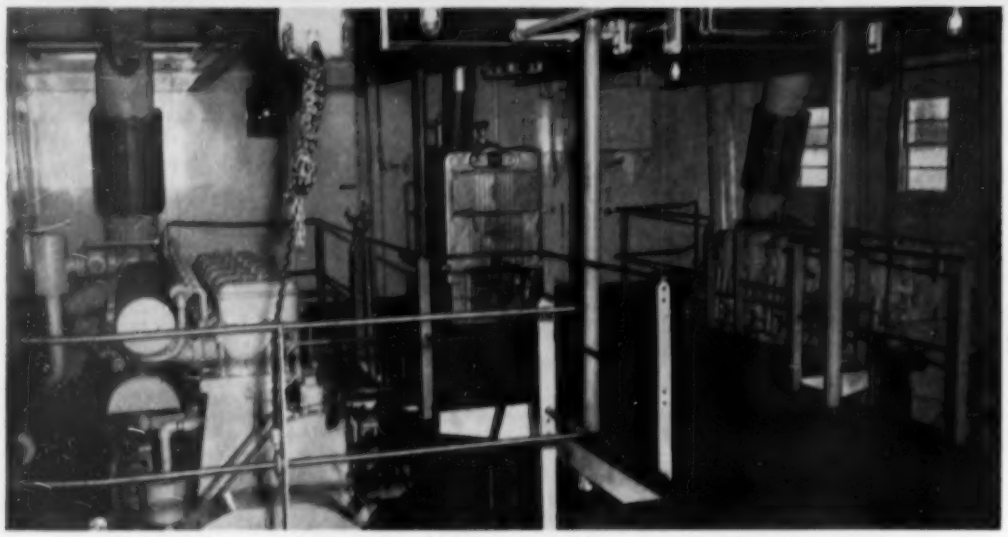
Fire extinguishers—CO-Two, Ansul Inc.

Pump motors—Ideal Electric.

Consulting Engineers—Stanley Engineering Co.

Makeup lube oil is transferred from storage to the engine sump tanks through Pittsburgh Equitable meters. At left are the Crane 3-way valves that permit movement of lube between sump tanks and used- and clean-oil tanks.





Upper engine room, looking forward, showing two Baldwin-Lima-Hamilton diesels which deliver a total of 2100 hp. Burgess-Manning exhaust silencers are on both the main and auxiliary engines.

M/V "MIKE CREDITOR"

NAMED for the president of the Ohio River Co., the *Mike Creditor* is ready to join the fleet of that company. This is the second of three sister ships being built by the St. Louis Shipbuilding & Steel Co. The first of these modern diesel towboats, the *A. H. Crane*, was delivered in 1954. (See DIESEL PROGRESS, July 1954, pages 66-67.) The *A. L. Long* is nearing completion.

The *Mike Creditor* is 140x35 ft. with a normal draft of 6½ ft. The sleek vessel will handle coal barges for the Ohio Valley Electric Corp. The sturdy hull is framed on the transverse and longitudinal system with scantlings exceeding American Bureau of Shipping requirements. Bottom and side plating is ⅜-in. thick; bilge and tunnel plating ½-in.; and all bulkheads are ⅜-in, stiffened both vertically and horizontally. The stern structure permits water to enter the propellers as easily from the sides as from the bottom. Specially designed Kurt Nozzles give the 2100 hp boat an increase of 25% in pushing power.

Propulsion is provided by two Baldwin-Lima-Hamilton supercharged marine diesels. Each is rated 1080 hp at 600 rpm. The 92-in. diameter, 4-blade cast steel propellers turn at 238 rpm, power being transmitted through Falk gears with 2.516:1 ratio. The main engines and reduction gears are arranged with complete mechanical control from the pilot house.

The Lakeshore Electric switchboard is on the upper engine room deck. In the background are seen the two Caterpillar 75 kw generator sets.

The cooling of the main engines is accomplished by circulating the jacket water through St. Louis Ship closed skin cooling ducts. There are also installed Graham lube oil coolers and Hilco lube oil purifiers. Two powerful steering systems of the St. Louis Ship mechanical-hydraulic type are installed. One system controls the two steering rudders and the other controls the four flanking rudders. The system is so designed that the rudders can be turned hard-over to hard-over in 12 seconds while towing.

Electric power is provided by two Caterpillar 75 kw, 220 volt ac diesel generator sets. The dead front switchboard for control and distribution of power was built by the Lake Shore Electric Mfg. Co.

The attractive deckhouse represents a modern approach to streamline design. The unusually large overhang of the decks forward, not only adds to the appearance, but provides protection from the elements for men working on the forward deck. The deckhouse is of all-welded steel construction with steel partitions at forward and after ends of engine room. All surfaces exposed to the weather are insulated with 4-in. thick insulation, and the lining and partitions throughout are ¼-in. tempered Masonite.

The extremely spacious pilot house, affording clear vision in all directions, has a front window of special Ohio River Company design. In the pilot house console are located the Morse Engine Control Stand and two pairs of steering levers. The radar set is a Raytheon and the radio-telephone is a Radiomarine. An 8-in. Triplex Kahlenberg Bros. air whistle is located on the pilot house roof. The *Mike Creditor* should prove a worthy addition to the fleet of one of our outstanding river operators.

List of Equipment

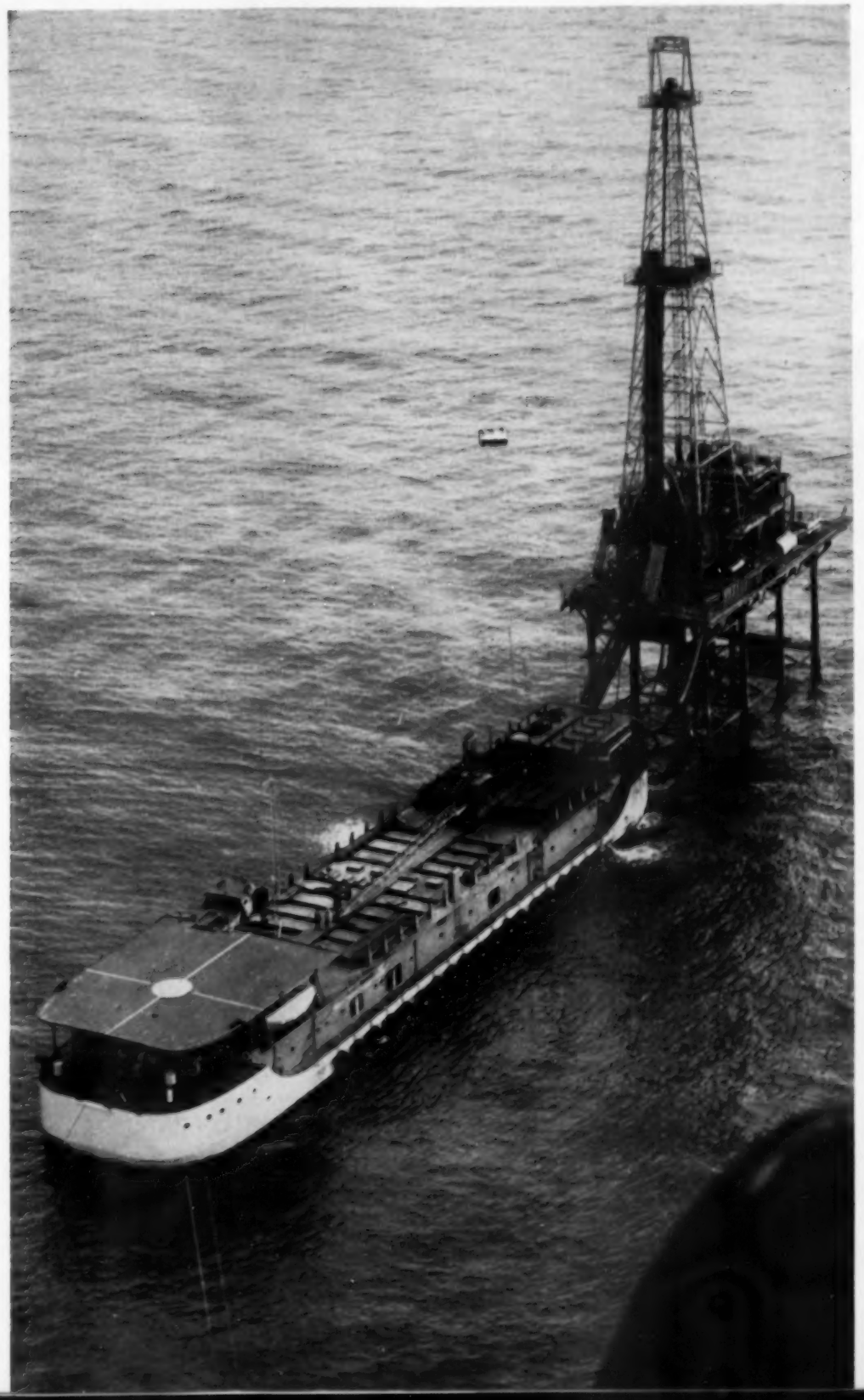
Main engines—(2) Baldwin, Model 606-S. C., 6-cylinder, supercharged, 12-¾-in.x15-½-in, 4-cycle each rated at 1080 hp at 600 rpm.
Reverse-reduction gears (2) – Falk, Model 12 MB, Ratio 2.561:1 with two Airflex Clutches.
Exhaust silencers (2) —Burgess-Manning.
Lube oil coolers (2) —Graham.
Lube oil purifiers (2) —Hilco.
Fuel oil filter—Hilco.
Capstans—Schoellhorn-Albrecht Double Barrel with with 10 hp Vickers Hydraulic Motors.
Auxiliary generator sets (2) —Caterpillar, each 75 kw.
Switchboard (1) —Lake Shore Electric.
Generator exhaust silencers (2) —Burgess-Manning.

OFFSHORE DRILLING TENDERS "J. C. CRAIG" AND "CARLE SHARP"

By JAMES W. CALVERT

A fleet of giant ocean-going non-propelled drilling tenders, regarded by oil men as the most efficiently designed vessels of their type yet built for offshore oil prospecting, is being assembled by a syndicate of four major oil companies for deep-water operations in the Gulf of Mexico. The syndicate, known as the CATC Group, is composed of Continental Oil Co., Atlantic Refining Co., Tide Water Associated Oil Co. and Cities Service Oil Co., with operating control vested with the Continental Oil Co.

Several types of drilling tenders, both propelled and non-propelled, have gone into service since the development of the submerged oil fields in the Gulf, but the two vessels built by Levingston Shipbuilding Co., Orange, Texas, and the two still under construction, are tailor-made for the CATC deep-water operations. Their designers believe they have incorporated into this fleet the answers to most of the offshore drilling problems.



The newest of this class of tender to go to sea was the *Carle Sharp*, named for the manager of the Domestic Producing Department for the Gulf Coast Region, Atlantic Refining Co. Her sister ship, the *J. C. Craig*, was completed early in the fall in the Levingston yard. They are identical but we will write about the *Carle Sharp*, which is 260x54x16 ft. and is equipped with the most modern machinery, warehousing facilities, and living accomodations. Each vessel utilizes 10 diesel engines.

Three batteries of diesel engines supply the total power for the tender. The main engine drive group consists of three Superior PTDS-8 supercharged diesels which power the three Ideal-type E-500 mud pumps. These engines have an 8½-in. bore and 10½-in. stroke and are rated 650 hp at 900 rpm. Electric power for lighting and for the numerous motors aboard the *Carle Sharp*, comes from three Delco 100 kw generator sets, driven by a battery of three GM diesel engines. The third diesel unit consists of the Halliburton oil well cementing pumps which are driven by three GM diesel engines model 6045-C. A Lister diesel runs a standby air compressor.

All drill pipe, casing, mud pumps, active and reserve mud pits, bulk mud and cement storage, and tanks for fuel oil, drilling water and potable water storage are located on the tender. The latter is moored stern-to the drilling platform with flexible hose for mud circulation connecting the tender and the rig. This enables the tender to supply the essential drilling mud at any desired pressure without affecting the drilling platform by rolling or pitching of the tender at anchor. A two-way pipe handling system for moving individual units of pipe from the tender to the drilling platform permits an efficient operation without directly joining the vessel to the platform.

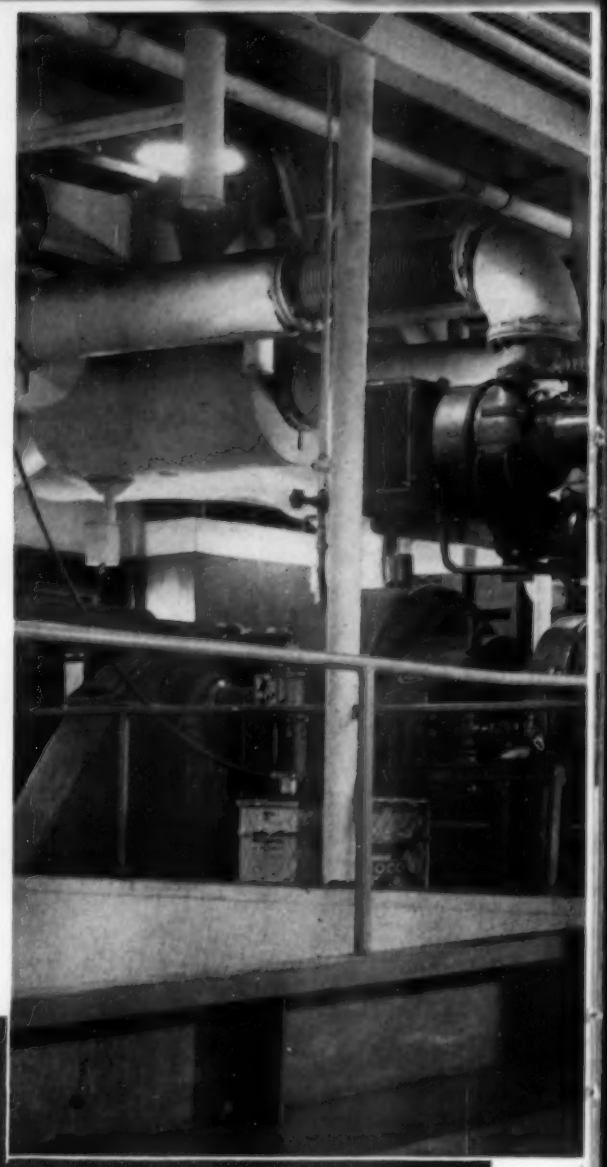
On the upper deck of the tender are pipe storage racks, with a total capacity of approximately 45,000 ft. of pipe, and a 70-ft. Osgood-General boom crane, model 325, for unloading pipe and materials from supply boats to the tender. Hatches on the upper deck lead to the built-in bulk mud and cement bins. There are four bins for bulk mud, with a capacity of 1000 sacks each, and two bins for bulk cement, which will each hold 1100 sacks. The bulk material is fed through the upper deck hatches directly into the bins and thence through hoppers to the mixing pits on the main deck.

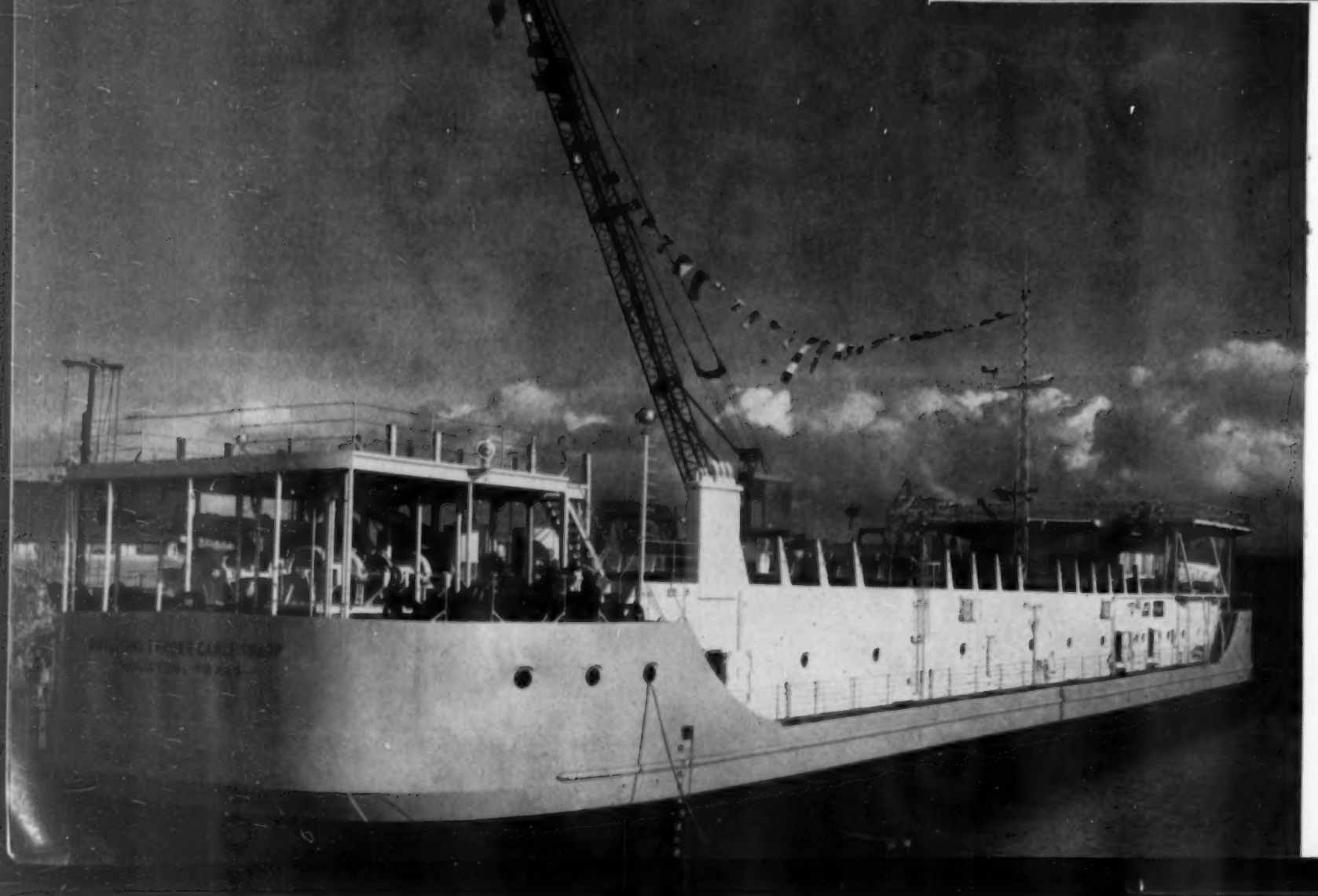
Drilling mud is mixed on the main deck by two Lightnin' mud mixers. The reserve mud pits hold 1538 barrels of drilling mud and the active pits contain 554 barrels. Liquid storage tanks, built into the hull of the vessel, provide two fresh water tanks, each with a capacity of 630 barrels; drilling water tanks with a total capacity of 13,000 barrels, and two potable water tanks of 156 barrels each. The tender has two fuel oil tanks which have a capacity of 402 barrels each.

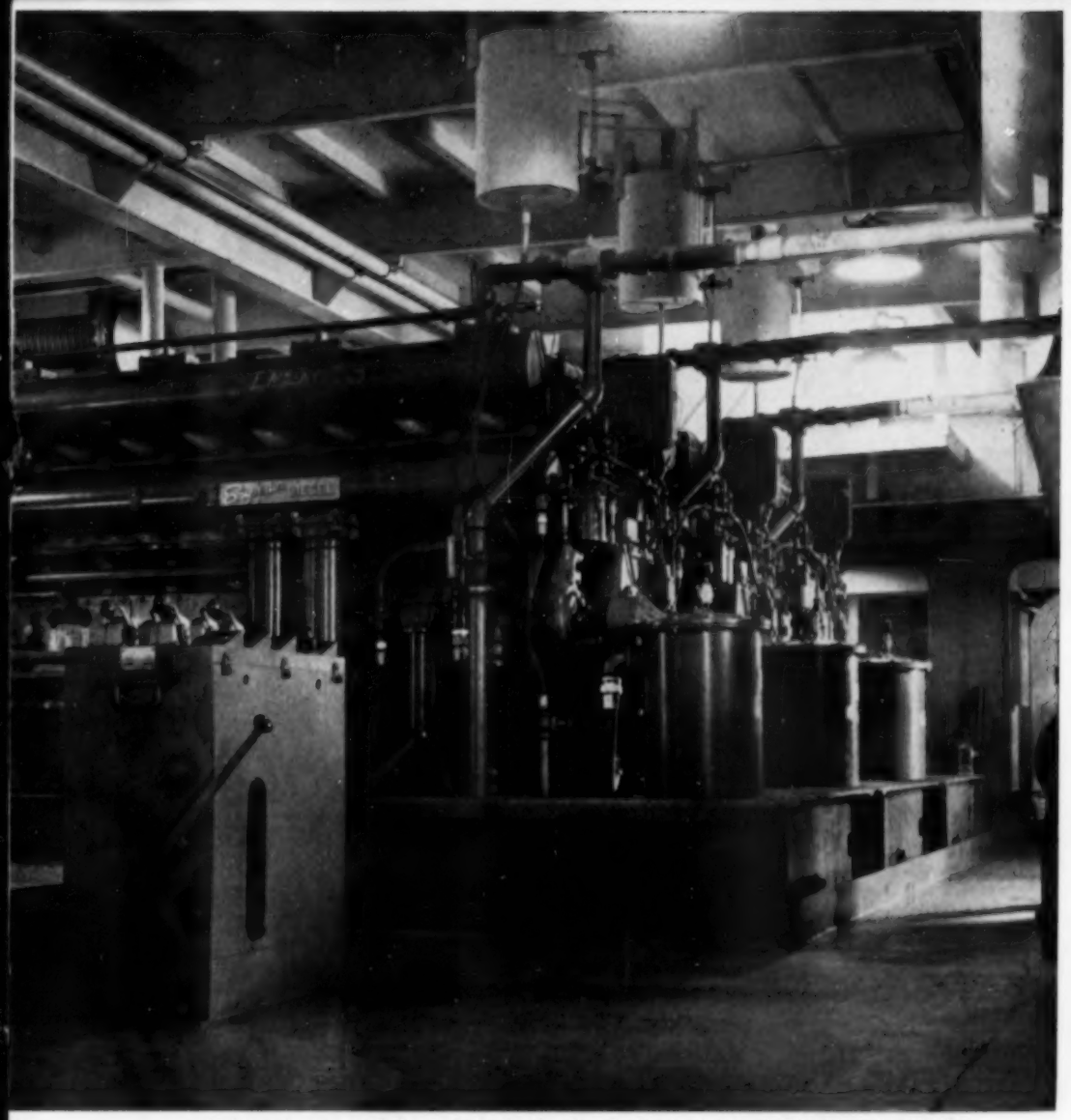
The new drilling tenders are named after the gentlemen shown here with their wives—Mr. and Mrs. Carle Sharp, left, and Mr. and Mrs. J. C. Craig, right.

The tender is held in position by seven mooring lines. The port bow has a converted LSM mooring winch, with 1200 ft. of 1½-in. wire rope, powered with a General Electric 50 hp motor. On the bow centerline is an automatic stern winch for LST, also powered with a General Electric motor. There is a bow starboard winch, and, on the stern (the end next to the drilling platform) are two Markey net tender double drum winches, powered with General Electric motors and controlled by C. Kirk Hillman motor control panels and Westinghouse magnetic winch brakes. The remaining ground tackle consists of two 1500 lb. Danforth anchors handled by Link-Belt anchor windlasses.

On the forward end of the tenders, forming a part of the roof for the deckhouse, is a 64x54 ft. helicopter flight deck. The CATC Group has contracted with Petroleum Helicopters, Inc. of New Orleans to transfer drilling crews to both the tenders *J. C. Craig* and *Carle Sharp* by helicopter. Probably the most outstanding feature of the *Carle*







Main engine room of the *J. C. Craig*, showing the bank of three 650 hp Superior diesel engines. The turbochargers are Elliott; the lube oil filters, Winslow; fuel oil filters, Purolator; air filters, Air-Maze; thermostatic valves, Amot.

Sharp, however, is the comfort in which drilling crews live aboard the tender. There are air conditioned quarters for 50 men and each room is equipped with its own thermostatic temperature control. A spacious recreation room has writing tables, card tables and television, and the equally spacious dining room has facilities for feeding 32 men, cafeteria style, at one time. If a drilling crew ever lived in ocean-liner luxury during each 10-day tour of duty, it is the men assigned to the *Carle Sharp*.

Safety features include two 25-man lifeboats, with required equipment, ring buoys and life preservers, and a carbon dioxide fire fighting system throughout the ship. During rough weather the tender is backed away from the drilling platform, but only when hurricane weather is forecast will the vessel be towed to shelter.

The CATC Group expects to use this and the other tenders in waters up to 100 ft. and deeper, where it is considered now too deep for drilling by the conventional type submersible drilling barges. The group has several "firsts" to its credit. It has drilled the farthest from shore (35 miles off the coast of Louisiana); it has drilled the first wells in Federal leases in the area known as the Outer Continental Shelf; and it is operating in the deepest water yet encountered by oil prospectors. This is a self-contained drilling platform in 97 ft. of water off the Louisiana coast near Grand Isle.

Organized in 1946, the CATC Group did extensive seismograph work off the Louisiana coast for three years and spudded its first offshore well in March of 1952 about five miles off Plaquemines Parish in Louisiana's West Bay. This wildcat resulted in the discovery of the West Delta Field. The group later brought in the East Cameron Block 71 field, drilling at sea 35 miles from the nearest land. CATC has approximately 25,000 producing acres off the Louisiana coast, and 339,000 undeveloped acres off the Louisiana and Texas coasts.

List of Equipment

(The following list applies to either tender since the *J. C. Craig* and *Carle Sharp* are identical.)

Engines (driving oil field equipment)—3 Superior PTDS-8 of 8½ in. bore, 10½-in. stroke, 650 bhp @ 900 rpm, continuous rating.
Engines (driving generators)—3 GMC 62404-RA maximum rpm no load 1260.
Engines (driving Halliburton cementing unit)—3 GMC 6045-C maximum rpm no load 2100.
Mud pumps—3 National Supply E-500.
Engine (driving standby compressor)—1 Lister diesel; (two regular service Gardner-Denver air compressors are driven by electric motors.)

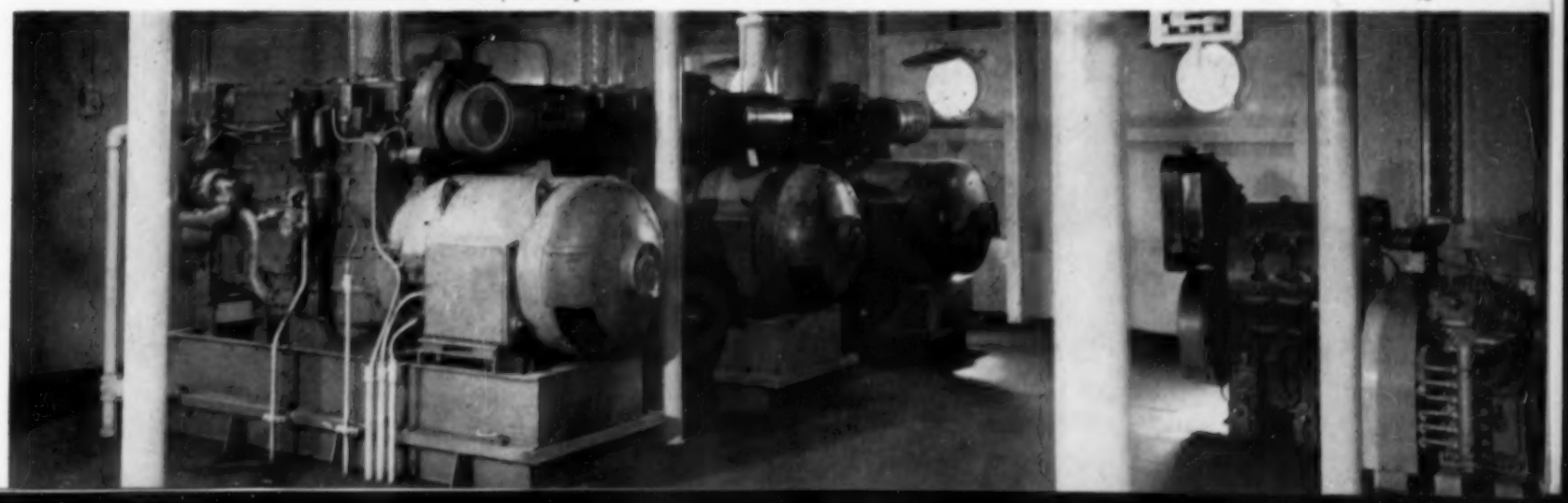
Accessories on Superior Diesels

Turbocharger—Elliott L-204.
Injection pumps—Bosch.
Exhaust manifolds—Helixhaust.
Lube oil filters (full flow)—Winslow.
Fuel filters (duplex)—Purolator.
Air filters—Air Maze.
Centrifugal water pump—National Supply.
Audible alarm system, low engine and turbo oil pressure and high water temperature—National Supply.
Thermostat—Amot.
Exhaust silencers—Maxim, 3 Model WMU-24 10-in. (plus 3 Model MU-10 for GMC diesels.)

Miscellaneous Equipment

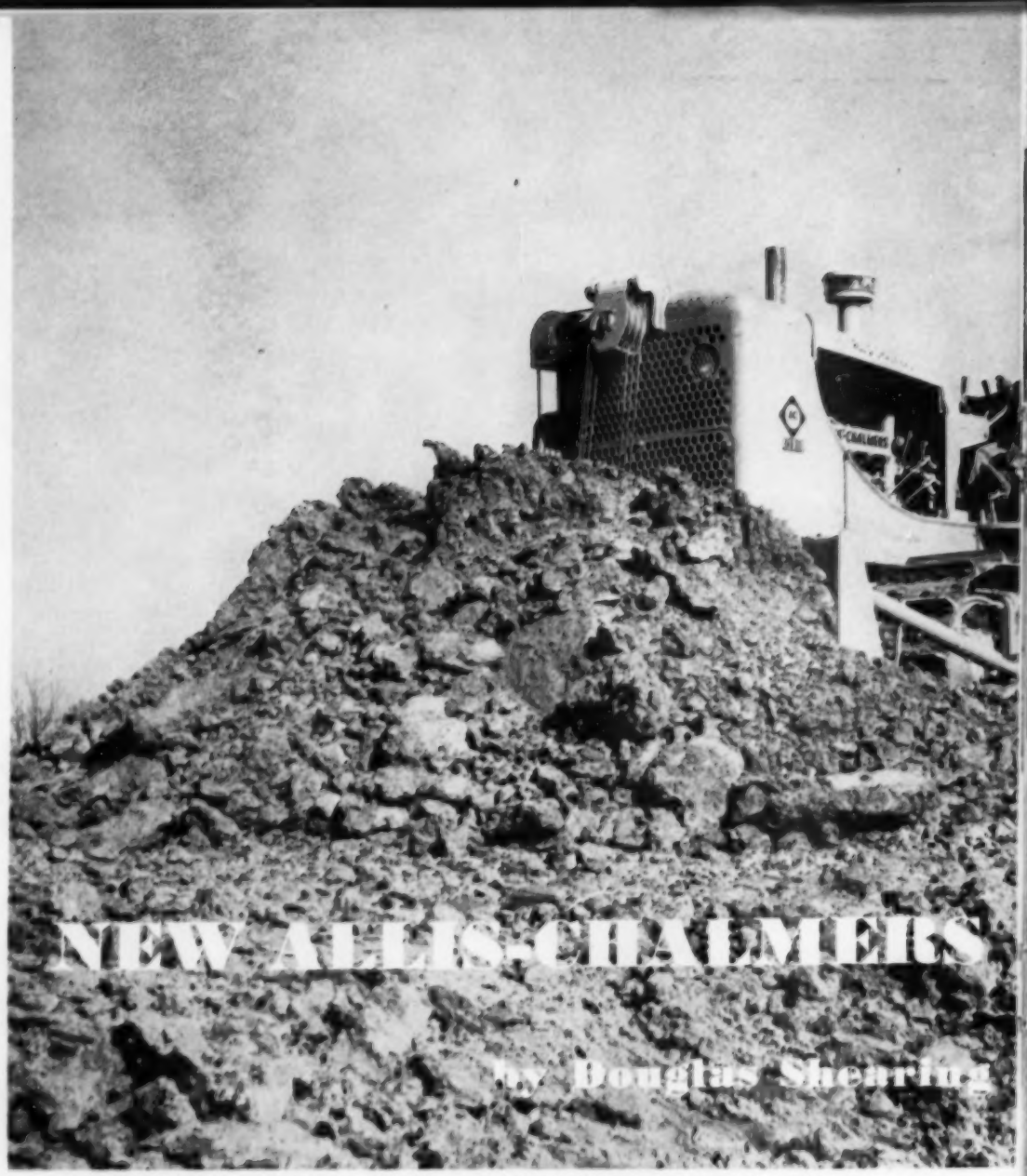
Generators—3 Delco YI-4353 225/450-v, 320-8/160.4 amps, 100 kw, 125 kva, 1200 rpm, 60 cycle, 13.8 amps exciter volts 125.
Revolving crane—Osgood-General 25-ton with 70-ft. boom.
Air conditioning—Ingersoll-Rand, Trane and Frigidaire equipment.
Fuel oil transfer pump—2 Gould rotary.
Priming pump—Viking.

Three General Motors diesels drive 100 kw Delco generators. Three other GM diesels, not shown, drive the Halliburton cementing unit. Small diesel at the right is a Lister on a Gardner-Denver standby air compressor.



NEW ALLIS-CHALMERS

by Douglas Sherrick



Allis-Chalmers Tractor Division calls this new HD-21 "the biggest, most powerful crawler tractor ever put into production." It weighs 44,000 lbs. and is powered by a "new Allis-Chalmers diesel engine" of 204 hp (net).

WHEN the $100 billions, 10-year road-building program fostered by the Federal government is launched, major manufacturers of dieselized construction equipment obviously intend to be in competitive positions. The types of equipment various manufacturers visualize as being what contractors want have been described in a series of feature and news articles in recent issues of DIESEL PROGRESS. And here is another in the series, introducing four new units that Allis-Chalmers will rely upon to help capture its share of what promises to be a big and continuing market for heavy-duty equipment.

Allis-Chalmers Manufacturing Co., has prepared as soundly as any competitor to battle for the big business that lies ahead. To begin with, the company began many months ago to fortify its position and diversify its line by buying other companies. It got into the rubber-tired earth-moving equipment field by acquiring LaPlant-Choate, Cedar Rapids,Iowa. It added a diesel engine factory by buying the Buda Co., Harvey, Ill. And more recently, Allis-Chalmers absorbed a principal supplier of bulldozers, road rippers, and snow plows—the Baker Manufacturing Co., located adjacent to the A-C tractor plant in Springfield, Ill.

The results of intensive economic and engineering research began to show up early this spring when the Allis-Chalmers Tractor Division started unveiling new models of heavy-duty equipment. Apparently these five units are forerunners of what will ultimately become a new and complete line of equipment. The new units now in production are: (1) Model TS-360 Motor Scraper, which features what is described as "a new 280 hp Allis-Chalmers diesel engine;" (2) Model HD-21 tractor which weighs 44,000 lbs., and develops 204 hp at the flywheel; (3) Model HD-16 tractor which weighs 31,500 lb., and develops 150 net engine hp at 1800 rpm with torque converter and 140 net engine hp at 1600 rpm with standard transmission; (4) Model YT Earth Drill, as an attachment for the 50-hp Model HD-5 crawler tractor; and, (5) an improved Model HD-9G 2-yd. Tractor Shovel.

The new HD-21 tractor also is powered by the "new Allis-Chalmers diesel engine." The company has only this to say about the engine: The "power plant benefits from the latest developments in combustion chamber design, applying them for the first time in the crawler tractor industry to produce a new kind of 'follow-through' combustion. The key explosion in the new engine occurs in a dual-chamber energy cell with the crankshaft well past top dead center, unleashing a spearhead of flame which produces a new standard of controlled combustion. This results in higher sustained working pressures at the most favorable crankshaft angles. Benefits to users are greater work capacity; smooth operation; effective lubrication; clean, complete combustion; low loading of engine parts and extra long over-all engine life."

The powerful new HD-21 tractor has a Twin Disc torque converter behind the engine. It is noteworthy to recall that Allis-Chalmers has pioneered the use of torque converters in tractors for more than 15 years and that just this year two major

Built at the Cedar Rapids, Iowa, plant of A-C, the TS-360 Motor Scraper has a 280 hp diesel. A cab on the earth-mover is optional equipment.

The new Model YT Earth Drill was designed for use on A-C HD-5 tractors which also carry front-mounted shovel or blade. Unit can bore hole up to 24 in. in diameter.

competitors came around to adoption of the Twin Disc torque converter in their newest and most powerful units.

Allis-Chalmers literature puts great stress on "the high-output performance of the torque converter-engine-transmission team." Extra speed and pulling power is foreseen, plus wider speed ranges and more range overlap. A new transmission and advanced design in the torque converter, resulting from years of field experience contribute to this ability to handle the bigger loads demanded in today's construction jobs.

Another feature of the HD-21 is the "wrap-around" radiator guard which permits hydraulic rams or cable sheaves to be mounted directly on the guard. The guard tilts forward and down for servicing. The cooling system includes a one-piece radiator which handles coolant water only and has an independent mounting to provide maximum protection from external damage. A separate heat exchanger insures ample cooling of torque converter fluid, and an engine lubricating oil temperature regulator insures proper operating temperature.

The A-C TS-360 Motor Scraper, produced in Cedar Rapids, weighs 49,000 lbs., and has capacities of 15 cu. yds. struck, and 20 cu. yds heaped. A fundamental change is a redesigned tractor main frame. It facilitates easy removal and servicing of various assemblies. For example, the engine can be removed without the transmission, and the clutch can be pulled without taking out the engine. The engine has an electric starter. Ignition is controlled with a key. When the key is out, the engine cannot be started.

The HD-16 is powered by the new Allis-Chalmers 6-cylinder, 844 cu. in. diesel. Maximum drawbar pull of 60,000 lbs. is obtained with the torque converter drive and a total of 31,700 with standard transmission at rated engine speed. Under overload, the engine torque increases, thus resulting in additional drawbar pulls up to 35,945 lbs. at reduced travel speed. Other new design features of the HD-21 have been incorporated in this latest of the A-C units.

The Model YT Earth Drill is driven by the HD-5's diesel, through a power take-off. It can bore holes up to 24 in. in diameter. Optional equipment includes a pole setter capable of handling poles up to 45 ft. long. The drill can be mounted without disturbing either front-mounted shovel or dozer already on the tractor.

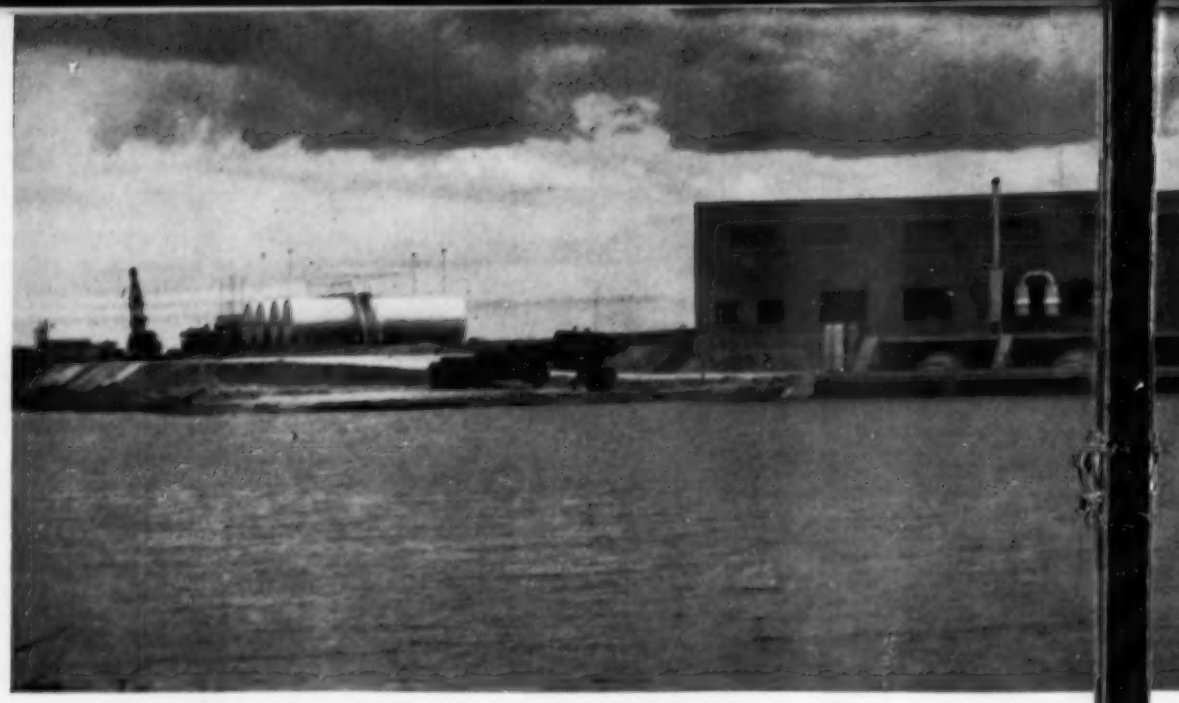
The Model HD-9G tractor shovel produces 100 net engine horsepower and 82 drawbar horsepower. Its 2-yd. bucket is described as of "a completely new design, with a deeper box section and replaceable wear plates." The unit also features a new hydraulic system which "practically eliminates external hoses, fittings and hardware."

A-C Tractor Division releases say nothing about the power plants that will be provided hereafter in smaller model tractors and scrapers.

The Model TS-360 Motor Scraper is powered by a "new 280 hp Allis-Chalmers diesel engine." The pan holds 15 cu. yds. struck, and 20 cu. yds. heaped.

ONE of the world's largest pumping stations has gone into service as the heart of a gigantic flood-control system that promises to tame for all time Florida's deadly, rampaging waters. Located at 20-Mile Bend, mid-way between Lake Okeechobee and West Palm Beach, the new station houses six 116-inch Fairbanks-Morse horizontal axial-flow propeller pumps, each with capacity of 360,000 gpm at 11.1 ft. static head. The combined capacity of 2,160,000 gpm (3,110,400,000 gal. per day) makes Station 5A the world's largest low-lift pump plant. Only the higher lift stations at Grand Coulee Dam and Mill Creek, Cincinnati, can pump more water. Each of the Florida pumps is driven by a 1600-hp Fairbanks-Morse opposed-piston diesel, making this the world's largest self-powered pumping station.

Nothing less than giant measures could cope with Florida's water problem which has stirred men's imaginations and defied men's efforts for centuries. Prehistoric Indians dug the first canals in the great



World's largest low-lift pump plant, Station 5A stands at 20-Mile Bend, midway between Lake Okeechobee and West Palm Beach. Its six Fairbanks-Morse pumps can move 2,160,000 gpm, more than 3 billion gal. per day, from the West Palm Beach Canal into the conservation area to the South. This view shows the suction side of the station.

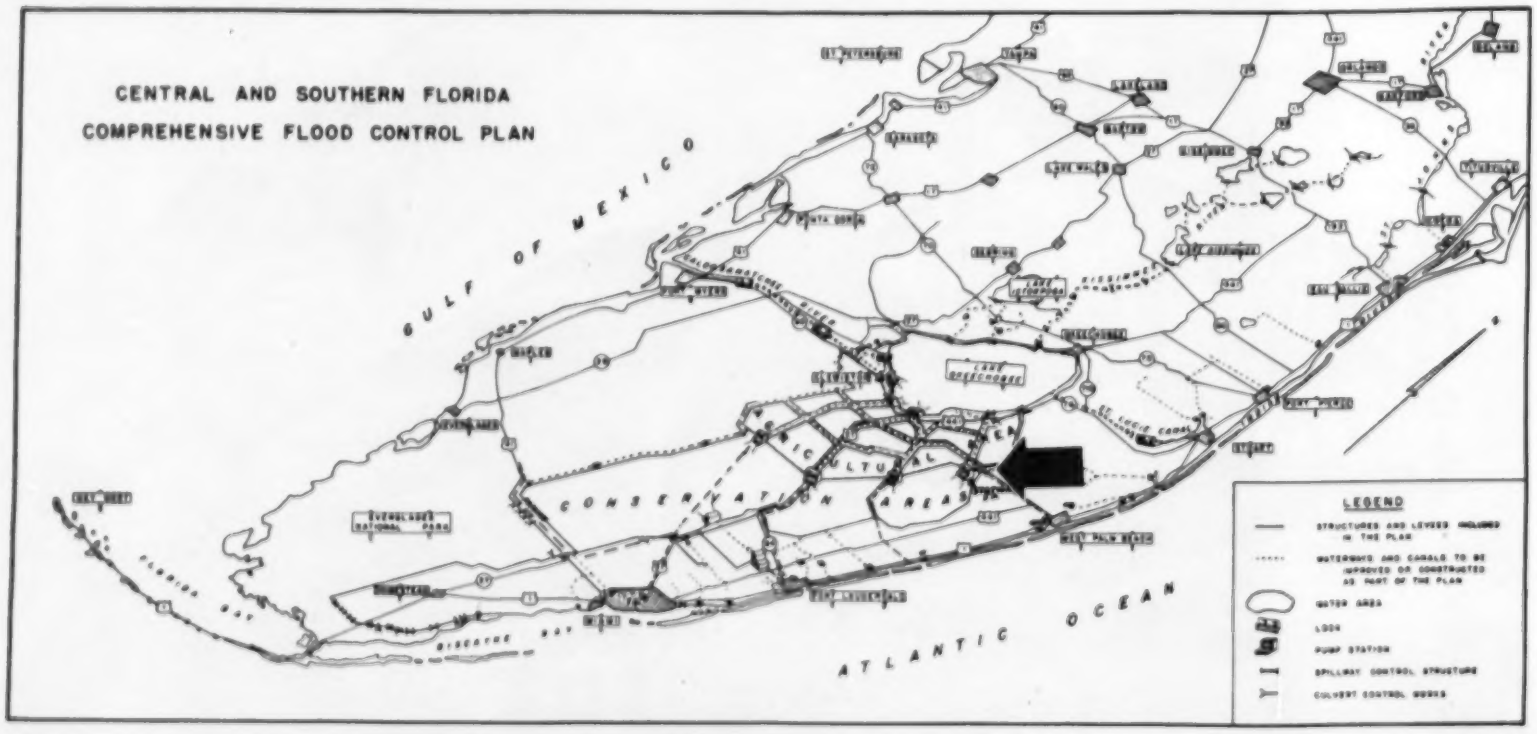
GIANT PUMPS GUARD FLORIDA AGAINST FLOOD AND DROUGHT

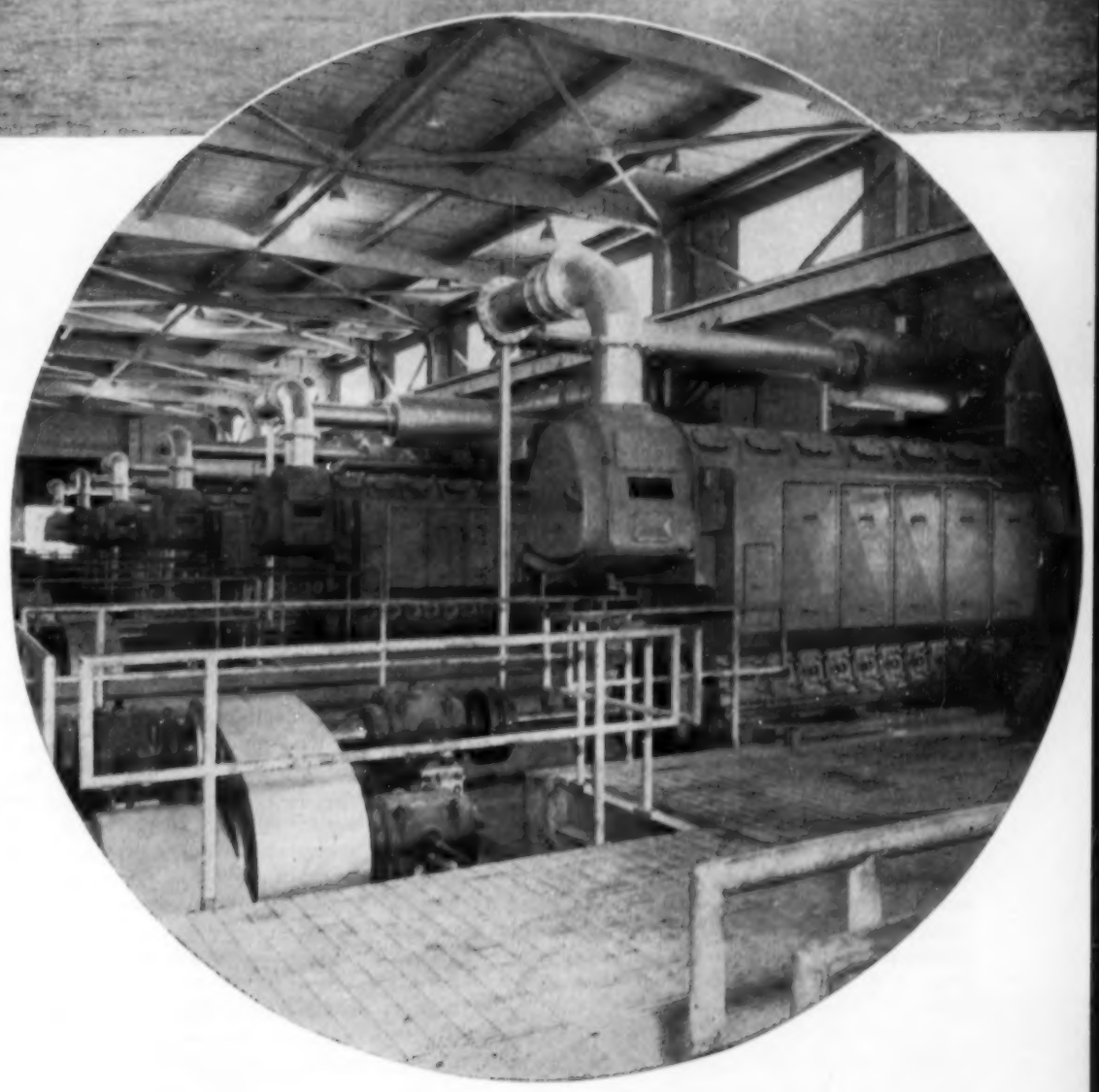
Everglades swamps, and the Congress of the United States first wrestled with the job of draining the glades more than a century ago. Millions of dollars were spent, canals were cut and levees constructed, but over-drainage brought damaging drought without preventing flood. No broad, effective plan emerged until successive tragedies forced state and nation to a project that encompasses a fourth of the state, geographically.

First tragedy was the flood of 1926, when hurricane winds lashed the waters of Lake Okeechobee out over its banks, drowning 500 persons. This was just a mild foretaste of the second tragedy two years later when hurricanes whipped the rain-swollen waters of the killer lake, drowning at least 2000 people. The third tragedy was one of lost possessions rather than lost lives when, in 1947 flood waters from the glades destroyed nearly $60,000,000 in property on the farms and in the resort cities of the East Coast.

The first remedial step was to cage the killer, hemming the lake with levees in the 30's. These dikes held against the flood of 1947, but it was evident that the valuable coast lands needed the protection of a levee from the lake to the tip of the peninsula to stem the flow from the Everglades. It also became evident to far-sighted men that isolated dikes and canals, however large, could never solve the complex water problem of the region. Sufficient drainage to lower the lake level and the water table in the glades during the wet season would merely substitute one serious loss for another. Flood would be replaced by draught during the dry season.

South of Lake Okeechobee, the rich organic muck capable of producing three crops a year requires a high fresh water table to keep the soil from literally burning away. The high water table is necessary, too, to nourish the fertile pasture lands of the Kissimmee River basin and to irrigate the winter





Six 1600 hp Fairbanks-Morse opposed-piston diesels drive the huge pumps through Morse double reduction chain drives. Station 5A is the largest self-powered pumping plant in the world.

vegetable farms of the Northern Everglades. A low water table in the glades permits salt ocean water to seep into the wells and contaminate the water supply of the coastal cities. Even the famous Florida climate is affected, for a high fresh water head in the interior helps to stabilize temperatures and prevent frost from destroying citrus fruit and truck farmer's cash crops.

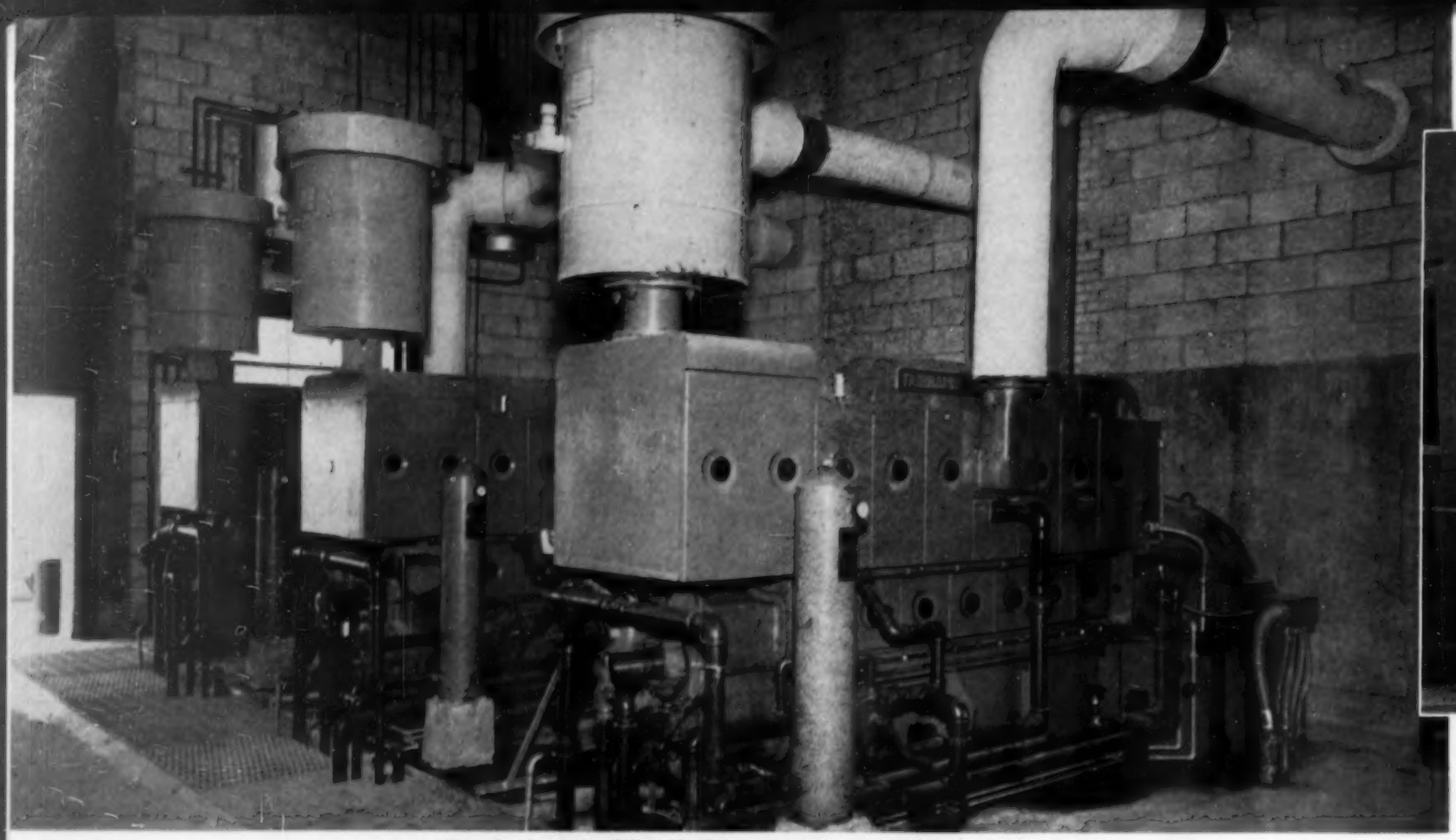
Moved to action by the damage suffered in 1947, Congress called for a survey and report from the U. S. Army Corps of Engineers. This task was performed with speed and thoroughness by the Corps' Jacksonville District and recommendations were made for a vast, comprehensive program to control Florida's waters, prevent both flood and drought, and incidentally to permit reclamation of 1100 square miles of rich land for agriculture. Construction was underway by January 1950.

Here, in brief, are the broad outlines of the plan. First priority went to a great levee extending 125 miles from Lake Okeechobee southward to the sea, protecting the Gold Coast cities from the waters of the glades. This project, the largest earth-moving job since the Panama Canal, was completed and dedicated in November 1952. Next came the key to the program, the control of water in Lake Okeechobee and the Everglades to protect against floods as well as to provide adequate water during the dry months. Utilizing the great levee as the eastern boundary, 1500 square miles of the southern glades were to be converted into three huge reservoirs or "conservation areas." Four of the old canals linking Okeechobee to the ocean were to be enlarged and a new canal dug; and each of the five high-volume canals would be linked to the conservation areas so that they could be used to transfer water between Okeechobee and the reservoirs.

Virtually the entire region is flat as a table and normal grades could not be depended on to move the quantities of water involved. Consequently, the master plan called for the construction of seven major pumping stations capable of moving more than 19 billion gallons of water in 24 hours. Thus, with the aid of higher dikes, more water could be held safely in Lake Okechobee, but in the event of rain or storm, a huge volume of water could be moved into the conservation areas for storage. This water could later be returned to the lake or used for irrigation as necessary to meet the needs or maintain the water balance of the region. Even while in storage in the glades, the water would serve vital functions, preventing salt water seepage, moderating climatic conditions, promoting bird, animal and plant life.

To round out the picture, the final plan includes a series of levees, canals, spill-ways and other control works in the valley of the St. John River, flowing north to Lake Harney, and in the valley of the Kissimmee River, flowing south to Lake Okeechobee. Peak flood waters will be carried off, but overdrainage will be prevented by shutting the "faucet" when safe levels are reached.

The system outlined is far from being completed, but much has been accomplished. The latest notable achievement was signalized on March 19, when Station 5A, the giant of the Okeechobee system, was dedicated and declared ready for service. The six great pumps in this 226x44 ft. hurricane-proof reinforced-concrete structure are Fairbanks-Morse horizontal axial flow propeller pumps measuring 116 in. at their diffusers and having 12 ft. by 18 ft.



To make the station fully self-sufficient, the engineers included three Fairbanks-Morse diesels driving 100-kw F-M alternators. Air-Maze oil bath air filters are used.

eliptical suction bells. Each pump has a 106-in. cast bronze, four-blade, air-foil propeller weighing 13,400 lbs. Pump and frame, exclusive of suction and discharge lines, weigh about 178,000 lbs.

Nearly six years of planning, design, model studies and construction by the Corps of Engineers and Fairbanks-Morse went into the development of these pumps. Axial-flow pumps were chosen because they provided excellent efficiency with relatively small weight and size for large volume pumping at low heads. Also, they were lower in cost than centrifugals or mixed-flow units. The size of the pumps was determined in part by an economic study which indicated that for a given volume of water, fewer but larger pumps would be more economical to operate than a larger number of smaller pumps. It was decided to install pumps as large as possible within the limit of available mechanical transmission systems.

Water flows to the station through a short cutoff from the West Palm Beach Canal, passing through trash racks to the suction bay for each pump. These bays are actually one long forebay with concrete splitters set 30 ft. apart preventing any turbulance from one bay from affecting the others. The bottom of each suction bay is at 5.5 ft. below mean sea level. The pumps go into operation at 13.0 ft. above mean sea level with normal drawdown to 8.3 ft. and maximum drawdown to 6.3 ft. Maximum discharge pool level is calculated at 19.4 ft. The pumps are rated on the basis of a static head of 11.1 ft. Since the invert of each pump is at 13.0 msl, the six pumps were provided with automatic-closing, semi-buoyant discharge gates to prevent backflow. Each gate has three horizontal shutters of cellular construction which open easily in sequence when a pump is started, minimizing back pressure. The pumps are primed by 10-in. motor-driven mercury vacuum pumps. Should the discharge gates become inoperative, the same vacuum pumps can be used in reverse to put the big pumps under four pounds of pressure.

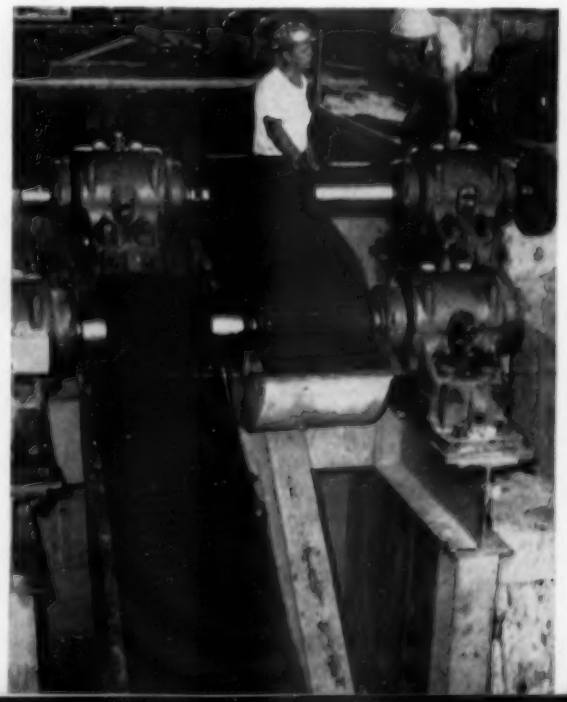
Diesels were chosen to drive the big pumps primarily to insure continuity of operation during storm periods when the plant would be most urgently needed and when electric power transmission lines would be most vulnerable. Also, the power and efficiency characteristics of diesels suited them admirably to operate axial-flow pumps at variable speeds to meet changing load conditions. Still another factor was the operating economy of diesels in a plant where annual service equivalent to 52 days of full-capacity pumping is anticipated. With purchased power for electric motors, demand charges would represent a sizeable expenditure. The biggest factor by far, however, was the need for a dependable, weather-proof power supply.

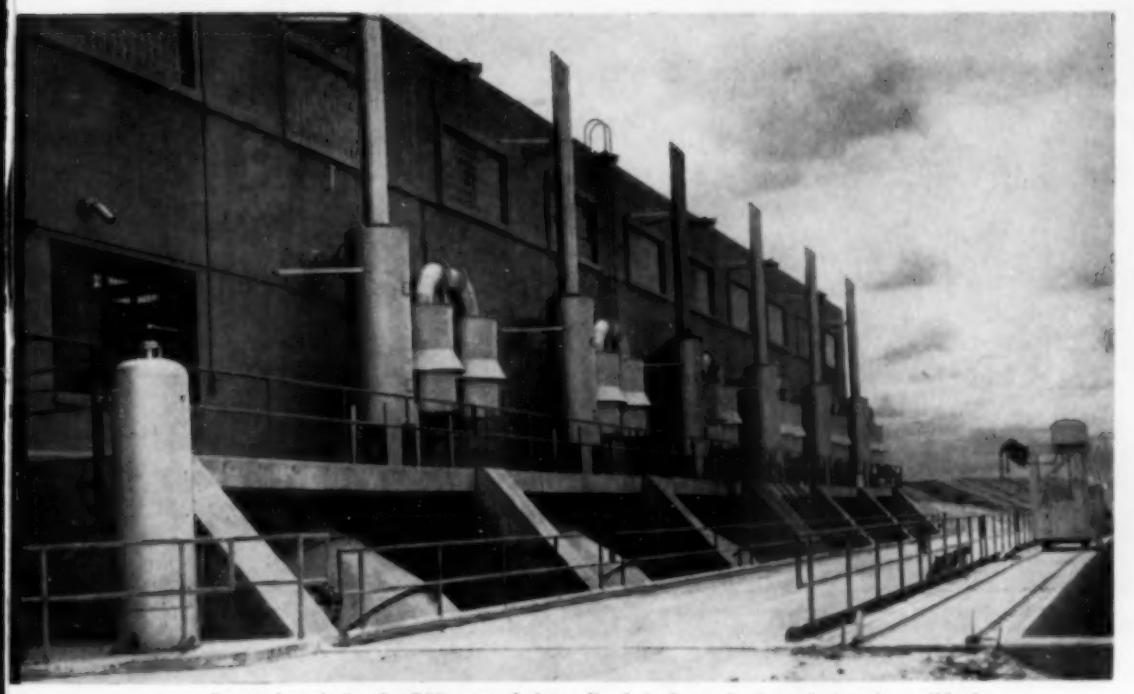
The engines are 10-cylinder Fairbanks-Morse opposed-piston diesels of 8-1/8-in. bore and 10-in. stroke, rated at 1600 hp each at 720 rpm. Each engine drives its pump at a rated speed of 124 rpm through double-reduction chain drives with a ratio of 5.80 to 1.

Fuel oil for the main engines flows by gravity from four 25,000-gal. above-ground storage tanks, through separate full-flow strainers, to individual 1½-in. motor-driven transfer pumps, located in the basement beneath each engine. It is then pumped under pressure through individual meters to separate 300-gallon day tanks, mounted 36 ft. above the operating floor and equipped with automatic float controls. From each day tank, the fuel flows by gravity to an engine-driven supply pump; thence under pressure through a newly-developed duplex micron filter to the twin injection pumps and nozzles at each cylinder.

Lube oil is circulated under pressure through each engine by a built-in, engine-driven circulating pump, passing from the engine through a thermostatically-controlled blending valve, through a shell-and-tube cooler, through a full-flow strainer and back to the engine. A by-pass line at the pressure side of each circulating pump carries a continuous supply of lube oil to a cartridge-type, cellu-

Each diesel drives a pump through Morse double-reduction chains with a ratio of 5.8 to 1. Thus the 720 rpm diesel at full speed turns the pump at 124 rpm.





Scavenging air for the F-M opposed-piston diesels is drawn in through American oil-bath air filters. The engines exhaust through Maxim vertical silencers.

lose-packed purifier. From this purifier, the lube is returned to the engine by a built-in ⅓-hp motor-driven circulating pump.

Both jacket-water makeup and raw water are taken from the West Palm Beach Canal, the jacket-water being run through a water softener and chemical treatment unit before addition to each closed system's expansion tank. A 6-in., 10-hp, motor-driven centrifugal pump circulates the jacket water through each engine, through a thermostatically-controlled blending valve and through a shell-and-tube type heat exchanger. Raw water is circulated through each lube oil cooler and heat exchanger by another 6-in., 10-hp centrifugal pump, reaching the 8-in. water-cooled bearings on each chain drive by means of a by-pass line from the pressure side.

Scavenging air for the six main engines is drawn through individual oil-bath-type filters, arranged along an outside wall, just above the suction bays. Bracketed to the same wall, but high enough to avoid interference with the filters, are six vertical exhaust silencers.

Electric power for lighting and for all motor-driven auxiliaries is supplied by three 5-cylinder, 720 rpm, Model 31A6¼S, Fairbanks-Morse diesel engines, driving three 100 kw, 125 kva, 3-phase, 60 cycle, 480-volt alternators, direct-connected to individual 3-kw, 125-volt, dc exciters. With this internal power plant, the station is freed from dependence on outside electric transmission lines and is assured of continued operation throughout storm and hurricane periods. As further insurance that this vital plant can get into operation quickly, the engineers have provided a 28-hp, 1400 rpm, 3-cylinder, Model 48AS4 Fairbanks-Morse diesel to drive a standby starting air compressor and a vacuum priming pump arranged in tandem.

This flood control program is a vast project with endless ramifications. For example, we have not mentioned Pump Stations 9 and 13 down in the Davis agricultural area, a 105-square-mile fruit and cattle region west of Fort Lauderdale. These stations, of 2880 and 540 cfs capacity, would be considered big in most places but are overshadowed by giants like Station 5A. The planners of this program are too realistic to think they can triumph completely over unpredictable nature but, with the combined resources and engineering skills of Federal and State governments, local agencies and private industry, they are providing the basic facilities for control of Florida's difficult waters.

List of Equipment

Engines—Six Fairbanks-Morse Model 38D8-⅛, 10-cylinder, 8-⅛x10, opposed-piston diesels rated 1600 hp each at 720 rpm.

Main pumps—Six Fairbanks-Morse Fig. 6320, 116-in., horizontal, axial-flow, propeller pumps, equipped with 106 in. cast bronze propellers and rated 800 cfs each at a pool-to-pool discharge head of 11.1 ft.

Governors—Woodward.

Chain drives—Hy-VO Morse Chain.

Air compressors—Ingersoll-Rand.

Standby diesel engine—One Fairbanks-Morse 28 hp, Model 48AS4, 3-cyl., 1400 rpm diesel.

Diesel-generator sets—Three Fairbanks-Morse Model 31A6¼S, 5-cyl., 720 rpm diesels, driving 100 kw alternators.

Switchboard—Continental Electric.

Fuel oil transfer pumps—Roper.

Fuel oil meters—Neptune.

Duplex micron filters—Nugent.

Lube oil transfer pumps—Roper.

Lube oil full-flow strainers—Air-Maze.

Lube oil purifiers—Honan-Crane.

Lube oil coolers—Kewanee-Ross.

Heat exchangers—Kewanee-Ross.

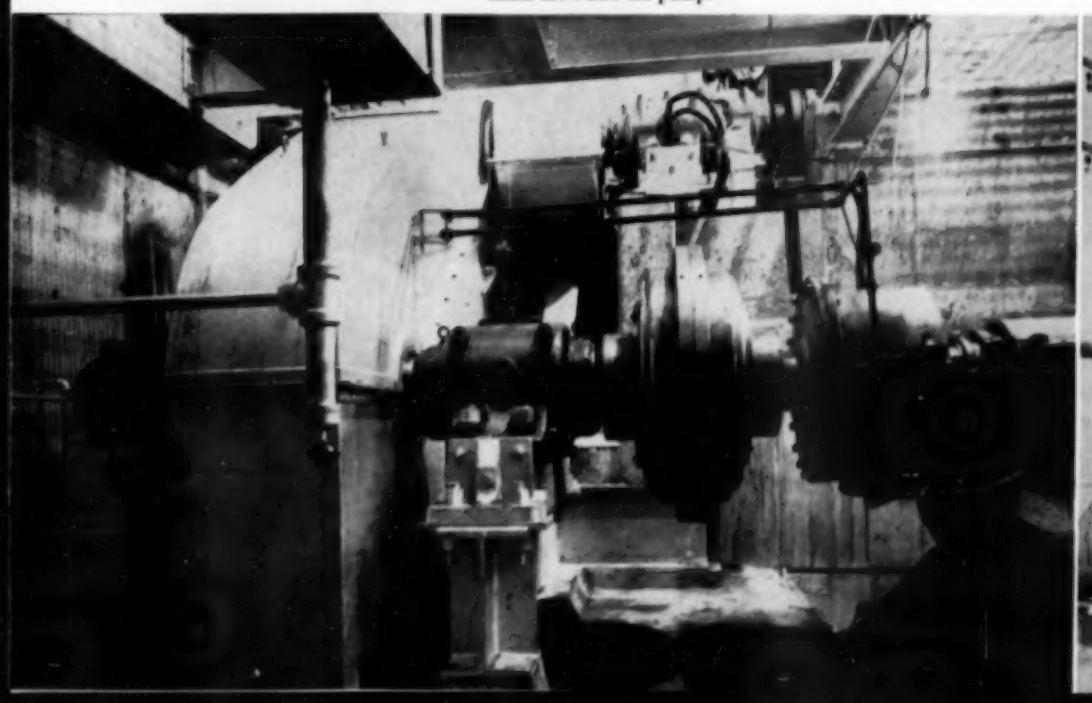
Air intake filters—American Air Filter.

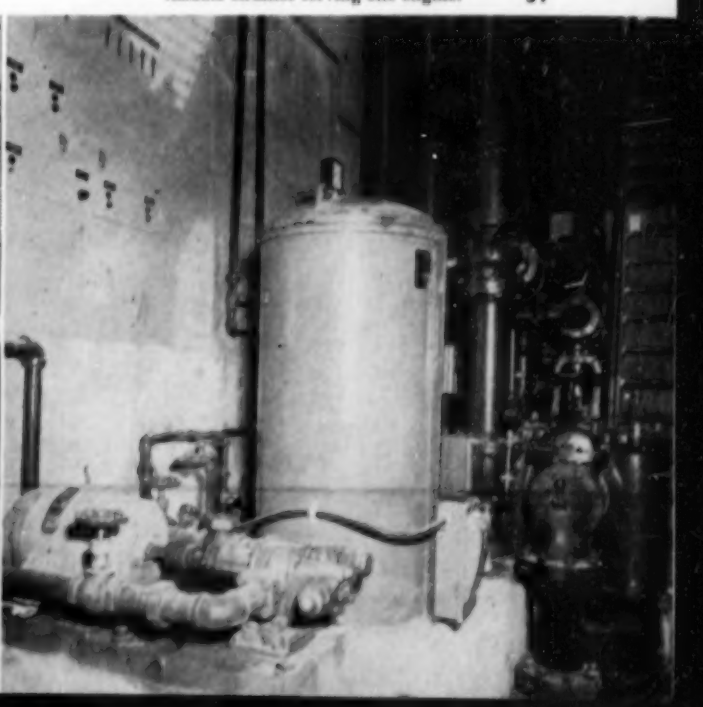
Exhaust silencers—Maxim.

Tachometers—Weston.

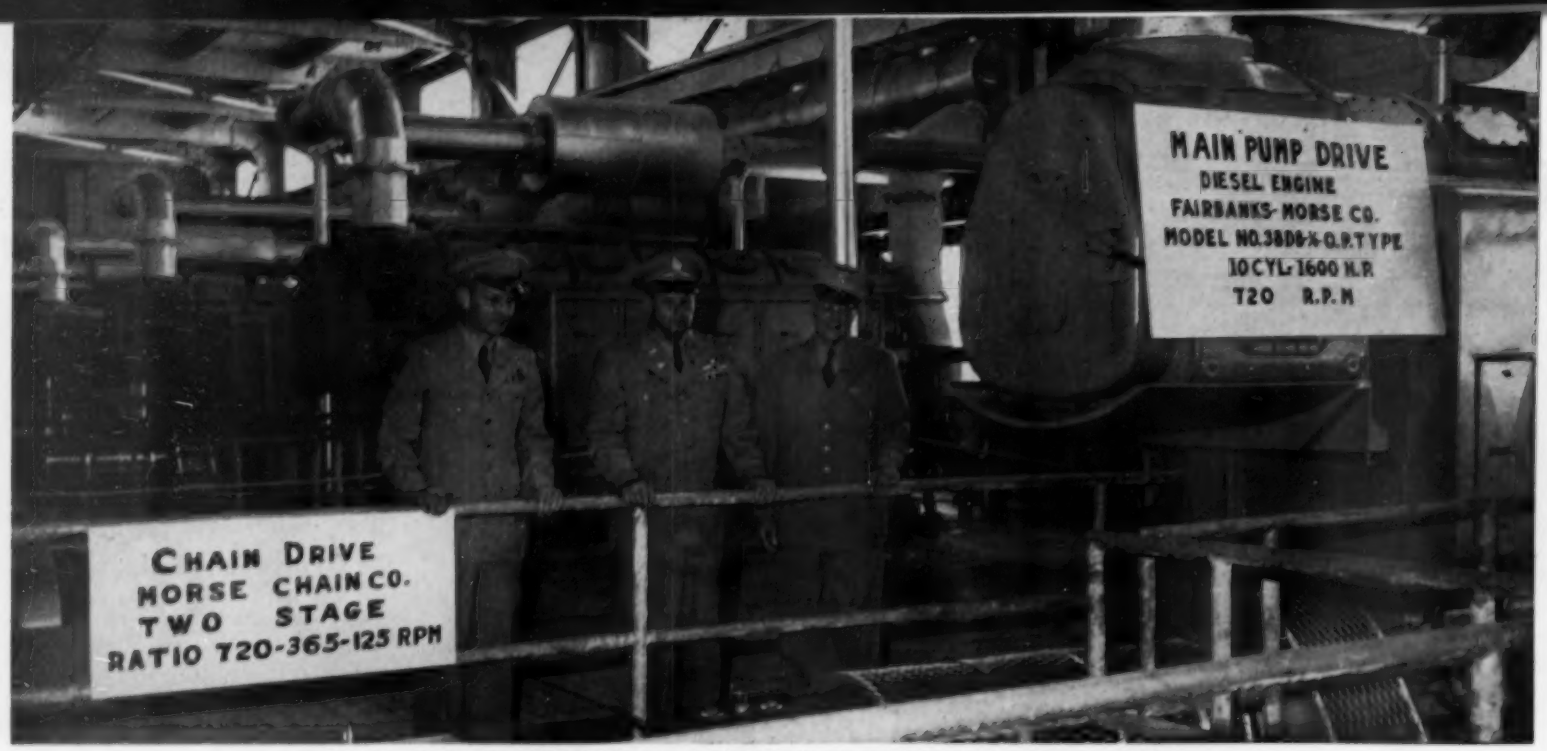
Exhaust pyrometers—Alnor Inc.

This view, taken from the pump chamber, shows the Morse chain drive with Thomas flexible coupling between engine and drive, and the Falk grid-type coupling between the chain drive and the pump.





Engine auxiliary equipment is located in the basement beside the pumps. This picture shows the Roper lube pump, Honan-Crane lube purifier and Andale strainer serving one engine.



Inspecting the Fairbanks-Morse opposed-piston diesels that drive the big pumps are Maj. General S. D. Sturgis, Chief of Army Engineers (center), Brig. General C. G. Holle (right) and Col. Herman W. Schull, Jr. (left).

FLORIDA PUMPING STATION DEDICATION

DEDICATION of the new 20-Mile Bend pumping station was an impressive affair. The self-contained pumping station, powered by giant Fairbanks-Morse diesels, was conceived on a grand scale to cope with an awe-inspiring problem. The new pumping station stands as a tribute to the imagination, foresight and engineering skill of the Army Corps of Engineers and the civilian personnel involved.

Major General S. D. Sturgis, Jr., Chief of Engineers, U.S. Army stated in his address that the ". . . Central and Southern Florida Project may well prove to be historic . . . one of the pivotal projects which, in addition to their direct benefits, by example point the way to further progress in the field of water resources development. During recent dry years, even normally humid regions are becoming increasingly concerned over problems of water supply. Here, by demonstrating the feasibility of comprehensive full-range undertakings within the framework of existing flood-control and major-drainage authority, by providing invaluable engineering experience in this two-way type of problem, and by helping establish patterns for adjusting the complex problems of Federal cost-sharing in projects of this kind, we may well be discovering the means of helping many another region to realize its full potential production for the strength of our nation."

J. A. Cuneo, vice president in charge of sales for Fairbanks-Morse, described the pumping station in his address at the dedication ceremonies. He stated, ". . . that the six Fairbanks-Morse pumps of the self-powered pumping plant could supply normal water requirements for three cities the size of New York." This is truly an amount of pumping to stagger the imagination.

In addition, the list of notable speakers at the dedication included five former governors of Florida, Senators Holland and Smathers, of Florida, and Schoeppel, of Kansas.

J. A. Cuneo, vice president in charge of sales, Fairbanks, Morse & Co., making an address at the pumping station's dedication ceremony.

Colonel Robert H. Morse, chairman of the board and general manager of F-M, was official host at a buffet supper following the dedication ceremony. Here he greets Brig. General C. G. Holle (right) and former Governor Doyle E. Carleton (left).

AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

AIR TEMPERATURE AND COOLING

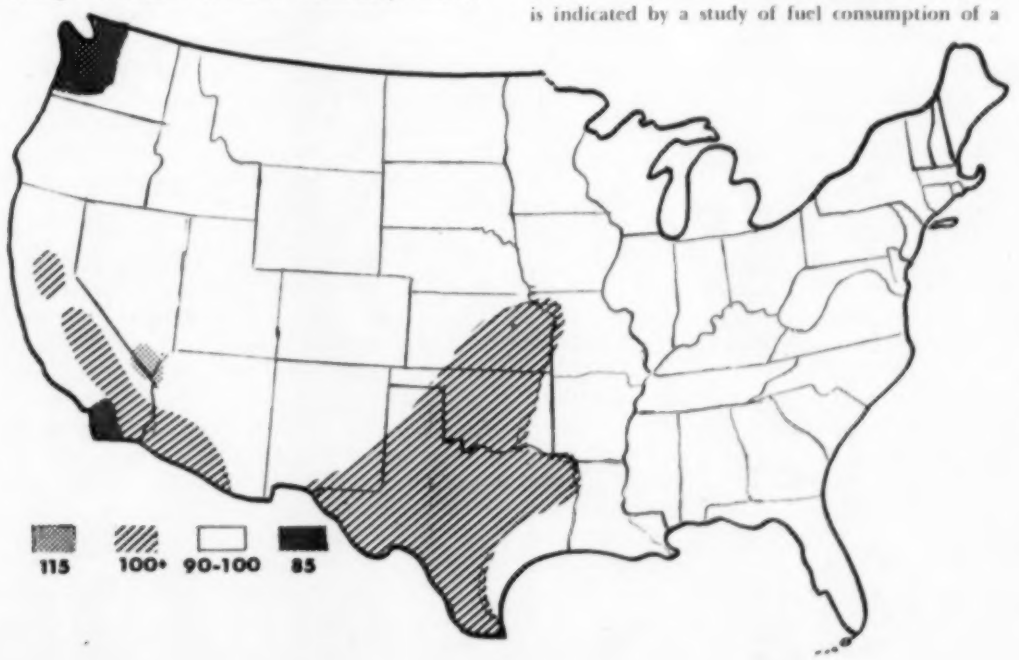
COOLING systems for automotive vehicles must be designed to function properly at all temperatures which will be encountered in service. The critical factor, of course, is the maximum for which cooling capacity must be provided. At first blush, this would seem to be the highest ambient temperature ever to be anticipated; but a moment's reflection will show that this would require considerable over-design, adding unnecessarily to the cost and weight of the cooling system.

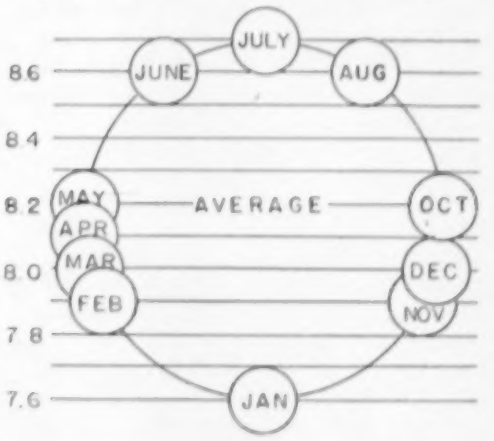
Fred Young of the Young Radiator Co., Racine, Wis., has come up with a concrete recommendation, namely, that for dry air cooling of the radiator, the correct temperature to be prepared for is that which, in the locality where the engine is to operate, is not exceeded more than 2-½% at any time during an average four-month hot-weather season. Based on observations of the U. S. Weather Bureau for the five years from 1935 to 1939, inclusive, he has prepared an isothermic map showing variations in the design temperature recommended for cooling systems in various parts of the country. As the map on this page (simplified from Mr. Young's elaborate two-color rendition) shows, these range from 85°f. along portions of the Pacific Coast to 115° in the vicinity of Hoover Dam. In automotive practice, such selective design is hardly practical, since vehicles must be manufactured to perform satisfactorily most anywhere they may be operated and the designer has no means of knowing, in most cases, where any particular one will go. However, the data presented does show that while it is hardly necessary to provide for Hoover Dam's 115°f., ability to function properly at 100°, as required over the greater part of Texas, Oklahoma and southwestern Kansas, would seem to be the minimum requirements.

Seasonal Variations in Economy. Fuel economy of diesel trucks is subject to greater variations with the seasons than is commonly understood. Factors whose seasonal variations affect fuel consumption seem to be prevailing air temperatures, traffic density, the effects of snow and ice, and the amount of engine idling. Cooling air and decreased number of vehicles on the highway both favor fuel economy in the winter months, while snow and ice and extent of engine idling have the reverse effect. That these contrary influences do not balance each other is indicated by a study of fuel consumption of a fleet of 23 identical dieselized tractors operated in the East on a one-way milk haul.

During a period of 15 months, in which the average mileage per tractor was 140,000 miles, the average consumption of the whole fleet was 8.2 miles per gallon. Individual tractors showed averages from 8.8 to 7.4. But, as indicated by the circle chart on this page, the average of the fleet varied from a maximum of 8.7 in the month of July, down to 7.6 in January. Better than the yearly average was shown in the four warmest months, namely June, July, August and September, below average in five colder months,—November, December, January, February, March and April. Average consumption occurred in the month of May and October.

Air temperature, of course, affects the density of the air, so that greater power output from a given quantity of fuel should result with cooler intake air, though starting will not be easy. Obviously, the more vehicles on the road, the more traffic delay will be encountered. However, since milk runs are usually made at night, approaching large-city destinations in the small hours of the morning, this is less of a seasonal factor in this type of service. Snow and ice take their toll of economy through the greater tractive resistance of snow and the greater amount of wheel slippage when the roads are icy or slushy. Furthermore, the general speed of traffic is slower, all of which is inimical to good fuel economy. In the wintertime, moreover, there is apt to be more idling than in warm weather, for keeping the cab warm and for easier starting.





This photo was made in P.C.A.'s Kerlinger pit near Tracy, Calif. It is one of the largest producing gravel pits in the country. Both the 54-B Bucyrus-Erie dragline and the Wooldridge Cobra wagon are powered by Cummins diesels.

(Photos courtesy Watson & Meehan.)

PACIFIC COAST AGGREGATES

By KENNETH R. MacDONALD

THE extensive use of dieselized equipment, started in 1935 solely as an experiment, has helped Pacific Coast Aggregates, Inc. to grow into one of the nation's biggest and most successful producers of aggregates. Incorporated in 1929 as a consolidation of scattered pits and quarries, Pacific Coast Aggregates today operates 13 producing and 18 batching plants in Northern California and is a wholesale distributor of building materials.

Under the imaginative but practical management of A. K. Humphries, president; his son R. K. Humphries, vice-president and general manager; and Donald Meek, vice president in charge of sales, P. C. A. as it is known in the industry, has had record growth. It skyrocketed in 13 years from a 1941 business of $3,400,000, shipping 2,115,000 tons of aggregates to a 1954 record volume of almost $17,000,000 and total shipments of 5,200,000 tons of aggregates. Much of the credit for this growth is given by P. C. A. executives to the economies and efficiency made possible by use of diesel engines, an "experiment" which the company considers one of its highly successful ventures into the "comparative unknown".

In addition to producing and selling sand, gravel and rock, P. C. A. also sells acoustical insulation, masonry, plastic and stucco, refractory, roofing and waterproofing materials, as well as building papers and sheathing, concrete, plywood, nails, paints and other building materials. With 750 people on its payroll, the company has pits or quarries in Centerville, Eliot, Kerlinger, Lapis, Fair Oaks, Rockfield, Olympia, Yolo, Brisbane, Lemon Cove, Clayton, Concord, Sacramento, San Jose and Fresno. In the production of aggregates, P. C. A. operates a great variety of dieselized equipment, ranging from draglines, shovels and locomotives to bulldozers, dump trucks and portable rock crushers.

"Company leadership," explains R. O. Lippi, manager of P. C. A's Truck Department, "has always been imaginative, foresighted and daring enough to take a chance on new methods, new techniques and new equipment. We began using diesels in 1935 in one of our locomotive cranes by converting it from steam power. The experiment proved eminently satisfactory and we've continued to add diesels ever since."

Today P. C. A. has approximately $700,000 invested in 74 diesel engines which power 72 units in 15 plants (two of the locomotives in use have two diesels each). P. C. A's current list of diesels include 35 Cummins, 16 Caterpillar, 2 Buda, 4 IHC, 15 GMC and 2 Murphy. These engines have an unusually wide range of applications in the Pacific Coast Aggregates' operation. Both Lippi and James D. Gordon, superintendent of automotive maintainence, point out that in every application, P. C. A. makes certain that "the work load is in complete harmony with the engine's capabilities."

"Almost 20 years of experience with diesels," Gordon asserts, "has proved to us their versatility and has made it possible for us to achieve a true standardization with resultant efficiency and economy." Gordon has been with Pacific Coast Aggregates for almost 27 years, his employment dating back prior to the 1929 consolidation.

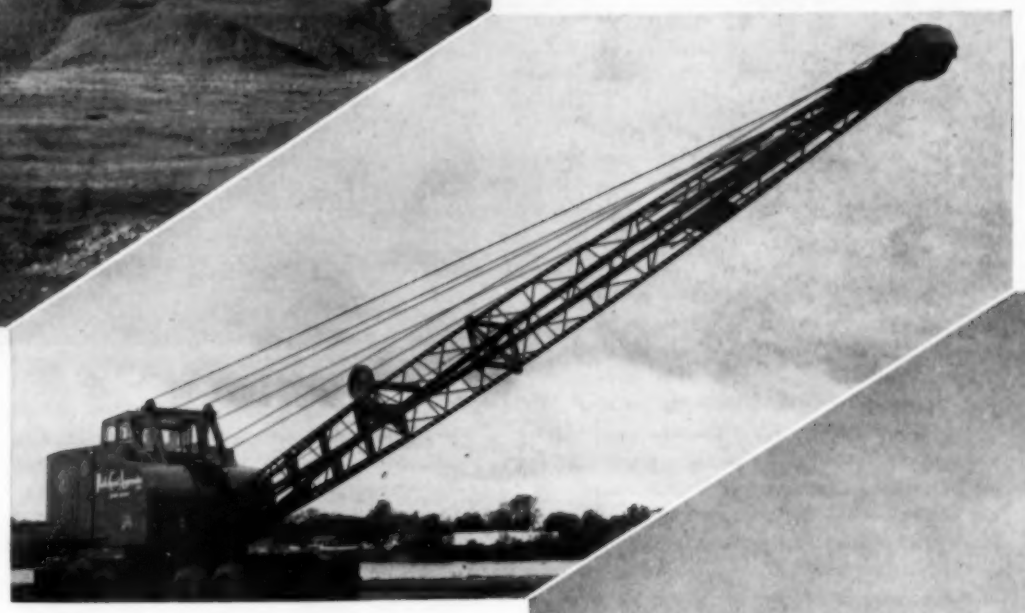
The company's willingness to "experiment" has not died with the years and P. C. A., in May of last year, put into use at its Pleasanton plant a revolutionary new Industrial Brownhoist wagon crane. It is powered throughout by electricity, generated by a Cummins diesel, and is the first Industrial Brownhoist ever built on rubber tires. It is powered with a Model HRBI-6 Cummins diesel turning a G.E. generator. This is a departure also for Industrial Brownhoist which in the past has concentrated exclusively on building railway cranes. It is unusual to propel mobile cranes, either on rubber tires or crawlers, by electric power as is done in this unit. Each axle has a motor.

"Although this remains an experiment with us," Lippi explained, "the Industrial Brownhoist on rubber wheels seems to be working out quite well and seems to substantiate our theory that the trend today is toward rubber-tired operation which provides much greater mobility. We also are experimenting rather extensively in the use of diesels with torque converters. At our Tracy plant, we are using a Model NHRIS-6 Cummins with a Torcon torque converter in a Bucyrus-Erie crawler dragline. We're convinced it is about the best."

P. C. A. has 15 Wooldridge Cobra wagons in use, loading them with drag lines and two Terra Cobra scrapers which are being used for stripping at the

Extent of the Kerlinger gravel sizing plant can be gained from this picture. Diesel engines are used in many applications here: switch locomotives, scrapers and dirt wagons.

PCA bought the first rubber-tired crane built by Industrial Brownhoist. Its operation is electric, with a 165 hp Cummins diesel turning the G.E. generator.



Yolo and Tracy plants. The Cobra wagons, powered by the 200 hp Model **HBIS-6 Cummins diesel,** can be used for both bottom as well as end dumping. The scrapers, which are not now being used so widely, are powered with 150 hp Model HBID-6 Cummins and when in use can self-load, carry and dump 15 cubic yards of material per trip.

"One of these dieselized Terra Cobra scrapers," Gordon explains, "with the aid of a pusher tractor, can take on a 20-to-25-ton load in approximately one minute and seven seconds. Using three scrapers to a pusher, the Terra Cobras can take on 17 loads an hour, figuring 1000 feet to a trip."

The Cobra wagons have been used extensively at P. C. A.'s Pleasanton location, where they haul 13 yards per trip and make seven trips of 1½ miles each way per hour. The Cobra wagons perform similar work at the Fair Oaks and Kerlinger plants.

The company also operates five diesel locomotives. Two of these are GE 25 ton with 150 hp Model HBI-6 Cummins. One is a Whitcomb 40 ton, with two 150 hp HBI-6 engines. The other two are GE 45 ton locomotives having two 150 hp Model HBI-6 Cummins engines. One of the major advantages of diesels over other power, as Gordon sees it, is the long life of the engines and the economy of maintaining and overhauling them. At the Pleasanton plant, for example, the Whitcomb locomotive ran for seven years before it was necessary to overhaul the first engine.

P. C. A. operates its own rebuilding shop at Hayward. Centrally located, all major overhaul work is performed there. Each plant superintendent, however, is responsible for the efficient and economical maintenance of the power equipment under his supervision.

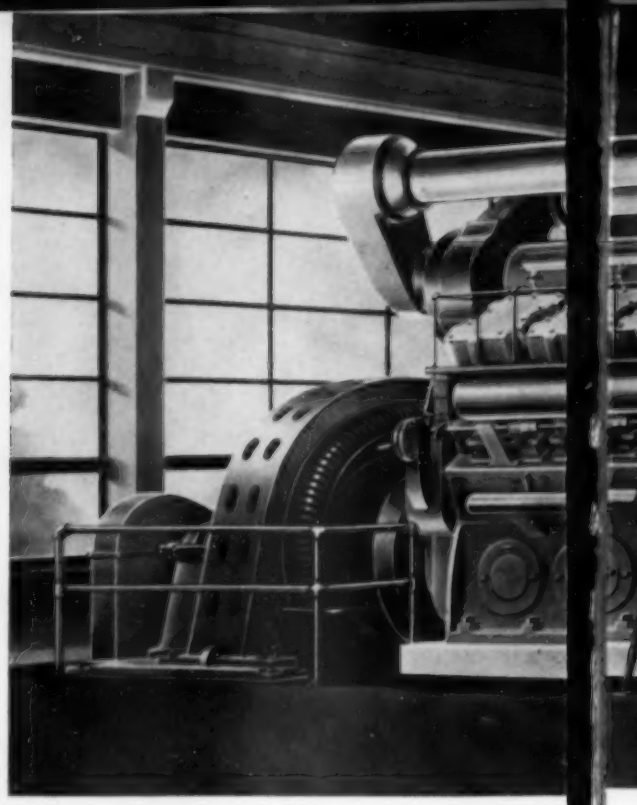
"We have a very practical preventive maintenance program," Gordon declared, "in which each piece of equipment is checked at the beginning of every shift. Once each month an oil sample from each engine is analyzed to determine when to change crankcase oil and to warn of any malfunctioning. In addition, a roving diesel crew goes from plant to plant at intervals and makes complete engine inspections on the spot."

This 40-ton Whitcomb locomotive is powered by twin Cummins engines of 150 hp. It is used by Pacific Coast Aggregates at its Eliot plant.

Industrial Brownhoist has long been noted as a builder of dieselized railway cranes such as this one, shown loading gravel at a P.C.A. plant. Its first unit built for off-rail operation went to P.C.A.

WORTHINGTON'S NEW SW14 ENGINE

By SIDNEY HOFFMAN

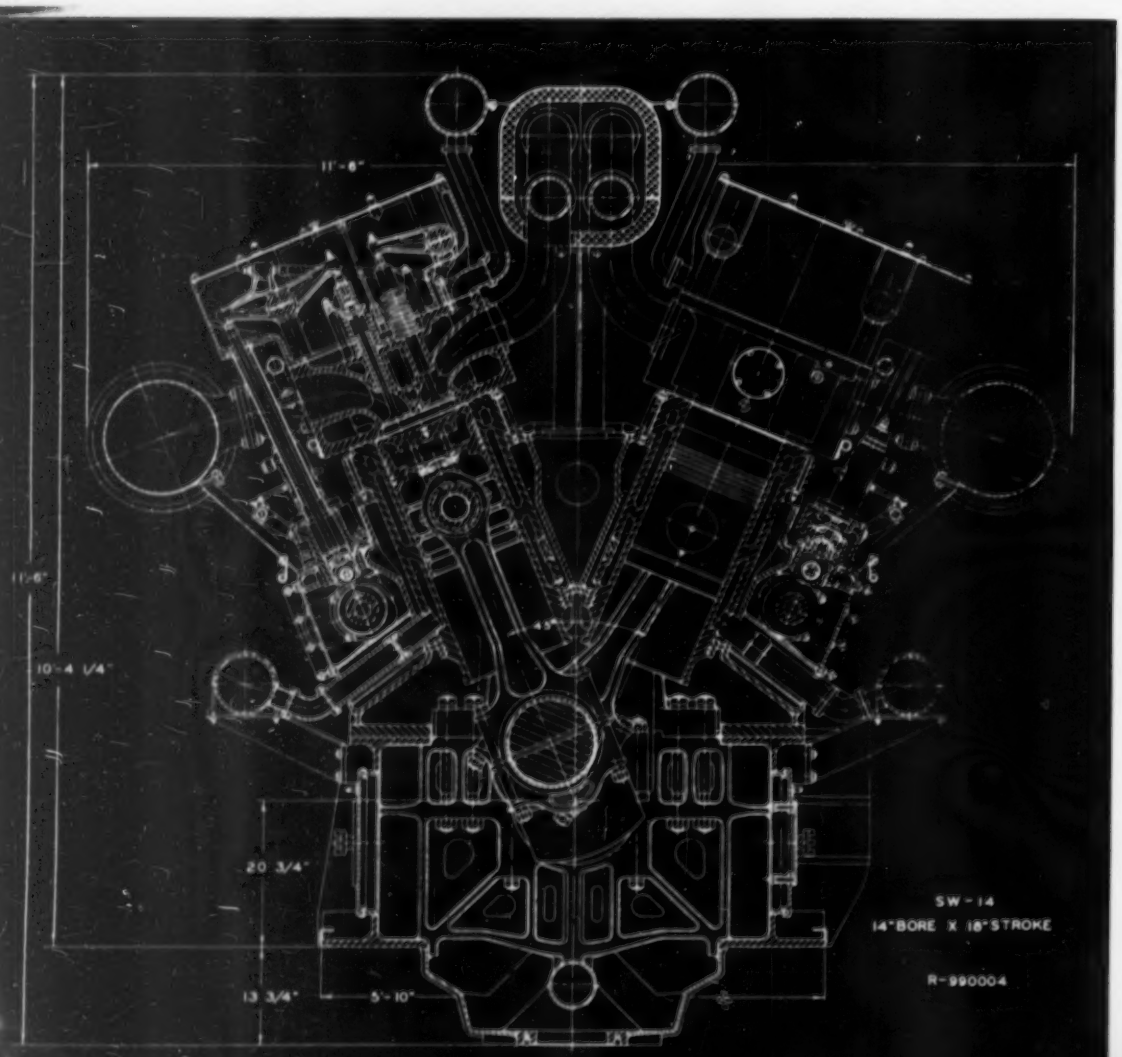


CURRENTLY In production at the company's Buffalo Works is Worthington's SW14 engine. Reputed to be the first heavy duty relatively low speed engine in this country, designed throughout for high-pressure turbocharging, it doubles former horsepower in single units. The engine is designed for continuous operation at brake mean effective pressures beyond 200 psi with top rating of 5000 hp.

Cylinder combinations are 6, 8, 12, and 16. The six and eight-cylinder engines both are built in-line while the 12 and 16-cylinder units are of the Vee type. They have a 14-in. bore and 18-in. stroke. For this bore and stroke, its present rotative speed of 450 rpm is conservative and the piston speed is only 1350 fpm. A 4-cycle high pressure supercharged engine, it inherently has low fuel consumption at all loads up to 10 percent overload. Adaptable to most economical liquid and gas fuels, it is available as an oil diesel, a dual-fuel diesel, a spark-ignition gas engine, and a tri-power engine.

Any of the above operates on the diesel compression cycle and is convertible to the other types without alteration of piston and cylinder heads. Of extra value to the user with power requirements calling for both the in-line and Vee engines in the same plant, is the interchangeability of major components. The same governor, cylinder heads, cylinders, pistons, connecting rods, precision bearings, bearing caps, fuel pumps, fuel nozzles, and miscellaneous small parts are used in the manufacture of the 6, 8, 12, and 16-cylinder engines.

Features of the new engines are: (a) Cylinder heads with high volumetric efficiency, through flow scavenging, self-aligning exhaust valve seat inserts, hydraulic valve lifters, and upper valve stem guides. (b) Pistons with controlled-flood cooling and dished crown design. (c) Cylinders with cast-in water jackets suitable for high temperature cooling and arranged so that all water connections are outside of the frame. (d) Dry type exhaust manifold for highest turbocharger efficiency and reduced cooling water requirements. (e) Worthington cast-in lubricating oil header and positive pressure lubricating oil system. The lubricating oil pump is directly driven from the engine crankshaft. (f) Arrangement for gear driven attached soft and raw water pumps from the engine crankshaft. (g) Conventional closed-in, die forged connecting rods in both the in-line and the Vee engines.



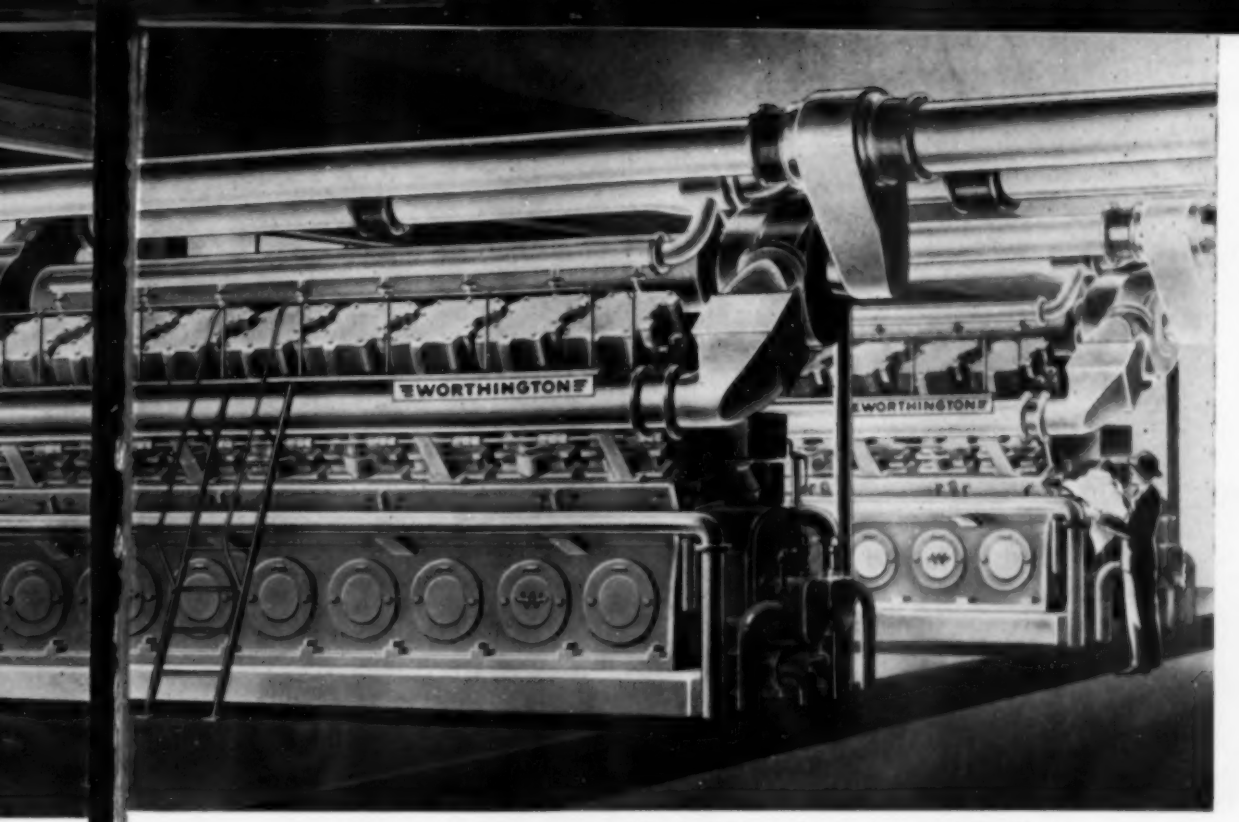
The many desirable features built into the SW-14 are the outgrowth of Worthington's past experience with its well established four-cycle supercharged engines. How these features fit into the engine's major functional components follows.

The Worthington combustion system, the heart of the engine, is designed around a high pressure turbocharger with conventional valve control and minimum air cooling requirements. No complicated valve actuating devices are used. The system includes a combustion chamber; an air system—turbocharger, aftercooler, air manifold, and insulated exhaust manifold and fuel injection equipment—pumps, lines and nozzles.

The combustion chamber is designed to burn a large quantity of fuel efficiently. This is accomplished without producing undue heat stress on surrounding parts. Much attention has been given to the combustion chamber bounded by the recessed face of the cylinder head. In it are mounted 4 valves—2 inlet and 2 exhaust. The passages to and from these valves are streamlined for high volumetric efficiency. The recessed face of the cylinder head eliminates necessity of valve cut-outs in pistons and also provides for maximum strength of the face of the head. To further improve uniform cooling, there is streamlined water flow around the exhaust valves. Tulip shaped exhaust valves seat on self-aligning valve inserts. Shape of the exhaust valves also provides additional cooling surface-effective during the overlap period.

The dished piston, concave crown design, symmetrical piston crown and uniform metal thickness is flood cooled. This type of piston provides for maximum strength and controlled cooling.

The cylinder liner with cast-in water jacket is baffled for high velocity uniform cooling around



Worthington Corporation's new SW14, 6-cylinder, in-line engine, now in production at Buffalo Works. This engine is available in 6, 8, 12 and 16 cylinders, delivering from 1350 to 5000 hp.

the combustion space at the top of the liner. Water passages are liberal with no possibility of stagnant pockets (hot spots).

For an air supply to support complete combustion and to provide for perfect scavenging, the engine is equipped with a high pressure turbocharger. Discharge pressure is only 8-10 psi gauge. This relatively low pressure permits using a comparatively small air aftercooler and reduces cooling water requirements far below that of other engines using much higher charging pressures. Exhaust and air manifolds are on opposite sides of the engine. On the Vee, this places the exhaust manifold between cylinder banks and the air manifolds on the outside along the coolest part of the frame. On the Vee, the important feature of separation of exhaust and intake air manifolds eliminates radiation from the exhaust to the intake air. This lowers the aftercooling air capacity engine requirement. Exhaust manifolds are dry insulated for improved turbine efficiency and to reduce cooling requirements.

Fuel injection pumps are mounted on the control side of the frame (directly above the camshaft) and are close to the injection nozzles. They are in the open, completely exposed to the air for radiant cooling and for maximum accessibility. Each pump is adjacent to its cylinder and requires very short fuel line to the injection nozzle. A bypass from each fuel nozzle is connected to a fuel bleed-off header. There is no way for fuel from the nozzles or pumps to get into the crankcase and dilute lubricating oil.

Cast-in water jackets are baffled for even distribution of circulating water and for high velocity cooling. All water passages are liberally proportioned for high circulation rates. This is particularly desirable where high temperature cooling is used. Circulating water is entirely outside of the engine frame. Such an arrangement eliminates electrolysis and corrosion of the frame. It also eliminates any possibility of lubricating oil contamination. From the header on the side of the engine, inlet water is led separately to the bottom of each cast-in cylinder jacket. It is then directed upward through connections to the cylinder heads. After a well directed path of circulation through the heads for effective cooling around valve seats and fuel nozzles, water leaves each head at the highest point and enters an elevated discharge water header. There are no chances for air pockets or vapor locks in this system. When engine powered circulating water system is required, raw and soft water pumps driven through spring type gears may be mounted on the engine. They are mounted on the forward end of the engine and are driven from the crankshaft.

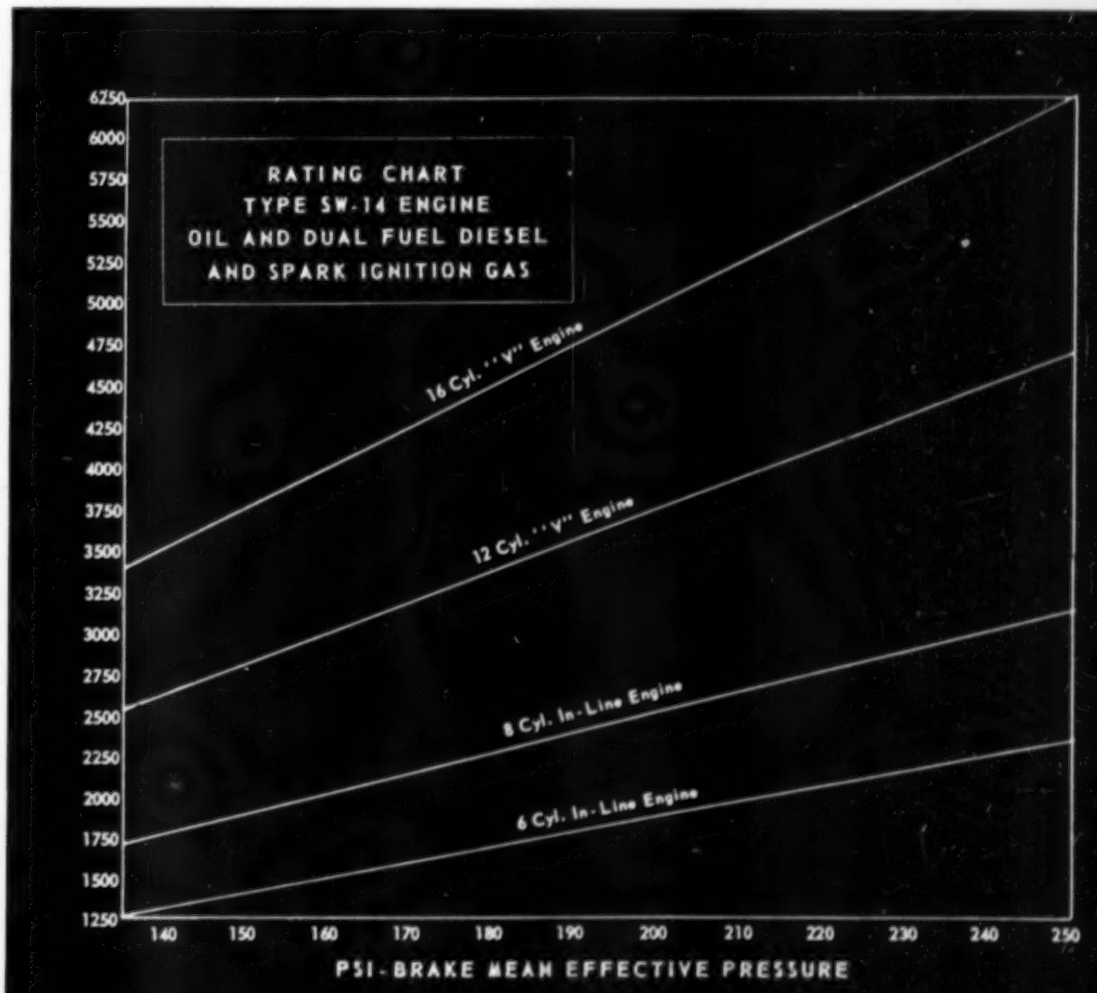
The lubricating oil system is the Worthington positive pressure type with main header cast in the base and drilled passages to main bearing seatings.

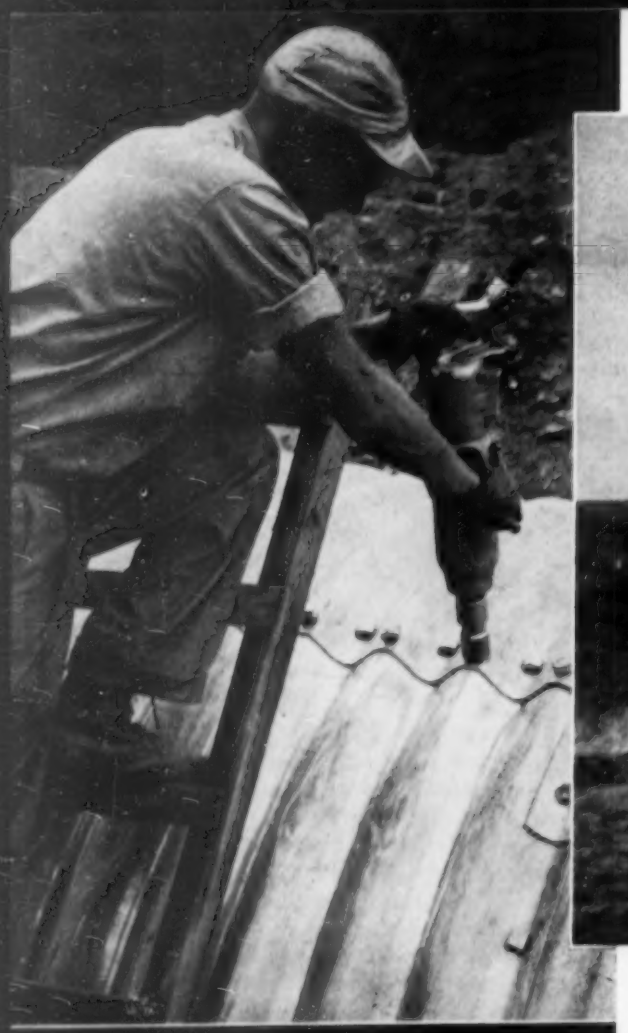
All lubricating oil is carefully filtered. Drilled passages in connecting rods direct oil to wrist pins and then to piston crowns for flood cooling. Branches from the main header provide oil for all other internal parts. Camshaft bearings are lubricated by oil supplied through lateral take-offs from a rifle drilled passage in the camshaft. A separate special micro-filtered oil supply serves the hydraulic valve lifters. Cylinders are splash lubricated with lubrication controlled by piston scraper rings.

The crankcase is of the dry type. Oil drains into an external sump from which the engine lubricating oil pump takes suction. The pump is driven through a spring type gear directly from the crankshaft and delivers oil through a full flow filter to a 6-in. main oil header cast in the engine base.

The SW14 engine is rugged, yet economical of space. It is structurally built for an output of well over 200 psi bmep. All modern features are incorporated in its design. None are radical nor untried.

The engine is now in production at Worthington's Buffalo Works. The engine's designers sought, and accomplished, a combination of pleasing and rugged appearance.





A total of 504 man/hrs. of labor was saved on one job by using impact tools to run nuts on 694 ft. of drain pipe.

Changing the cutting edges on large-capacity scrapers such as this is greatly simplified by the use of power tools

Center—Two men, using Impactools, can replace the manganese steel lip on this bucket in 3-to-4 hrs. instead of as many days using hand wrenches

Mechanics can get to the skilled work on truck transmissions in a hurry when routine disassembly is done by an electric tool.

POWER TOOLS HELP LOWER CONTRACTOR'S SHOP COSTS

MAINTENANCE is big business for a contractor, particularly if the contractor's operations are as far-flung as those of the Central Pennsylvania Quarry, Stripping and Construction Co., Hazleton, Pa. This construction firm maintains upwards of 100 pieces of heavy off-highway equipment; three large draglines (two 9W Bucyrus-Erie and one 631 Page) with booms as long as 200 ft. carrying 8 cu. yd. buckets; more than 30 bulldozers; and approximately 60 pieces of over-the-highway equipment. The job of keeping this equipment rolling requires the full-time attention of 35 skilled mechanics, a maintenance shop in Hazleton, and as many time and labor saving power tools as practicable for hundreds of jobs from running a wheel nut to bending the heavy steel bottom plate of a crane or shovel's big bucket.

Contractors long have been pioneers in using power tools to speed construction and to limit labor costs in the field. In fact, air-operated riveters, diggers, drills and jackhammers have replaced hand tools to such an extent that it is a common occurance today to pass a road gang without seeing a single man wielding a pick or shovel. Most contractors can't afford the "luxury" of the pick and shovel. Power tools do the job more efficiently and quickly. Central Penn, for example, in the last seven years, has equipped its mechanics with seven electric and air-operated Ingersoll-Rand Impactools, of various sizes, for use in the field as well as in its huge Hazleton shop. Since then the men spend less time removing cover plates and running nuts on construction jobs, and more time on actual productive labor, where their skills are utilized to the best advantage. The company is keenly interested in the labor savings these tools have introduced, but it is even more concerned with the reduction in down-time for trucks, bulldozers, shovels, and in the increased availability of all equipment.

In the field, it is not unusual for these power tools to pay for themselves in time and labor saved on a single assignment—such as the 504 man/hrs. one air-operated tool saved on a recent road job. Used to run thousands of nuts on 694 feet of new drain pipe, the tool cut nine days off the work sheets of a seven-man crew. At the company's shop the seven tools have replaced hand tools wherever possible, from small routine maintenance jobs to complete overhauls of trucks, shovels, graders, scrapers, scoops, bulldozers and other heavy equipment. Engine overhaul mechanics keep at least two tools

in the shop of Central Pennsylvania Quarry, Stripping and Construction Co., Hazelton, Pa.

Removing the dual tires on a big truck with a hand wrench is a slow, back-breaking job. A power tool cuts the time expended in half.

Dieselized Equipment is Kept on Stripping, Construction, and Quarrying Jobs More of the Time Due to Fast Maintenance With Air- and Electric-Operated Tools

busy all the time. Dieselized equipment includes 10 35-ton Euclid dirt wagons powered by twin engines; more than 60 other off-highway dumping vehicles, plus some 60 on-highway dump trucks.

In the maintenance of 6 and 8 cu. yd. buckets for the big shovels the power tools often have saved upwards of 50 man/hrs. of labor per job. In replacing the lip of a drag line's 6-cu. yd. bucket, for example, a new manganese steel casting has to be set in place and then drawn into position by tightening 32 bolts (1¼ in.) on each side. These bolts are then removed one-by-one and hot rivets inserted. Working with a hand wrench, it would take two men three days to tighten these bolts sufficiently and to complete the job, an average labor expenditure of 42 man/hrs. With one electric tool, two men can complete the same job in 3½ hrs.

If it were possible to compute the labor saving introduced by using the Impactool to replace a bottom plate on one of the larger 8-cu. yd. buckets, the value of these power tools could be even more graphically illustrated. But the thought of using a hand wrench on a job of this size is so forbidding that no one at the Hazleton shop has ever attempted it. On this job, the power tools are used to bend 1-in. thick steel plates. The forward section of these huge buckets is a manganese steel casting, and to it are welded and riveted the steel plates which form its sides, top and bottom. Replacing the top and sides is a comparatively simple operation, but replacing the worn bottom plate is a different story. This plate must be bent to conform to the slightly curved shape of the lip, and it is here that the Impactool comes into the picture.

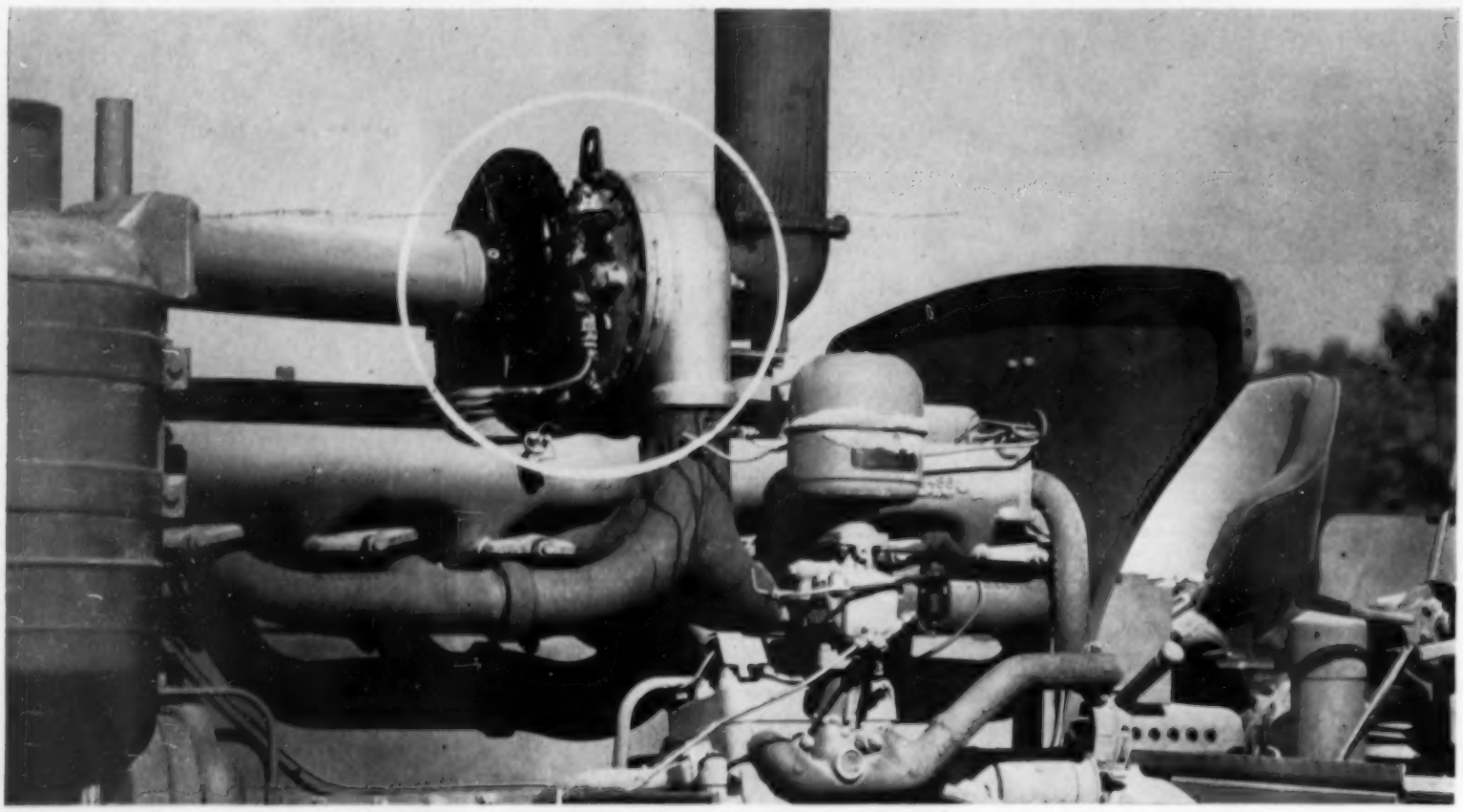
The first step in rebuilding one of these huge buckets is to flame cut the new bottom plate to size and grind the edges. The plate is then drilled for rivet holes and placed in position against the lip. After it is secured with ¾-in. bolts at the center, where there will be no bending, the nuts are drawn up with one of the air tools. Then, working on alternate sides away from the center, the mechanic puts in more and more bolts and draws them up tight with the impact tool, using the tool's power to bend the heavy steel plate into position against the lip. The lip is 1½ in. thick at this point, so that all bending is restricted to the plate. When the plate has been pulled into position, it is welded and the weld is heat treated. The bolts are then removed one-by-one and replaced with rivets.

Center—Here the power tool is being used to run studs on the front wheel of a truck. Two such tools are kept busy in truck work at Central Penn.

Two men, with hand wrenches, formerly consumed three hours to change the 10-ft. cutting edge on this scoop. Now it's done in one hour.

AIRESEARCH TURBOCHARGERS

By DR. ENG. W. T. VON DER NUELL*



Pictured is the first experimental AiResearch turbocharger as installed and successfully field tested on a crawler tractor.

WHEREAS the advantages of increasing the power output of reciprocating combustion engines by means of turbocharging have been known for several decades, turbochargers on mass-produced diesel engines have made their appearance in comparatively recent times. Part of the explanation for present activity is that the "big brother" of the turbocharger, the gas turbine, is coming of age, thus smoothing the road for the "little brother"—especially as regards materials, manufacturing progress, and integrity.

In the light of these facts, it is not surprising that the Garrett Corp., a large manufacturer of small gas turbines, brought up the "little brother" and with it branched out into the automotive and industrial field by establishing AiResearch Industrial Division which has begun delivering turbochargers to a leading diesel engine manufacturer.

AiResearch high-speed turbomachinery has been characterized by radial compressors and radial turbines of distinct characteristics for about a decade. With millions of hours of field experience, frequently under most difficult conditions in aircraft, it was only logical to use radial wheels, far less sensitive than axial blading, in turbochargers also. This background knowledge allowed AiResearch to include turbocharger applications with the toughest requirements as far as heavy-duty operation and superior performance are concerned.

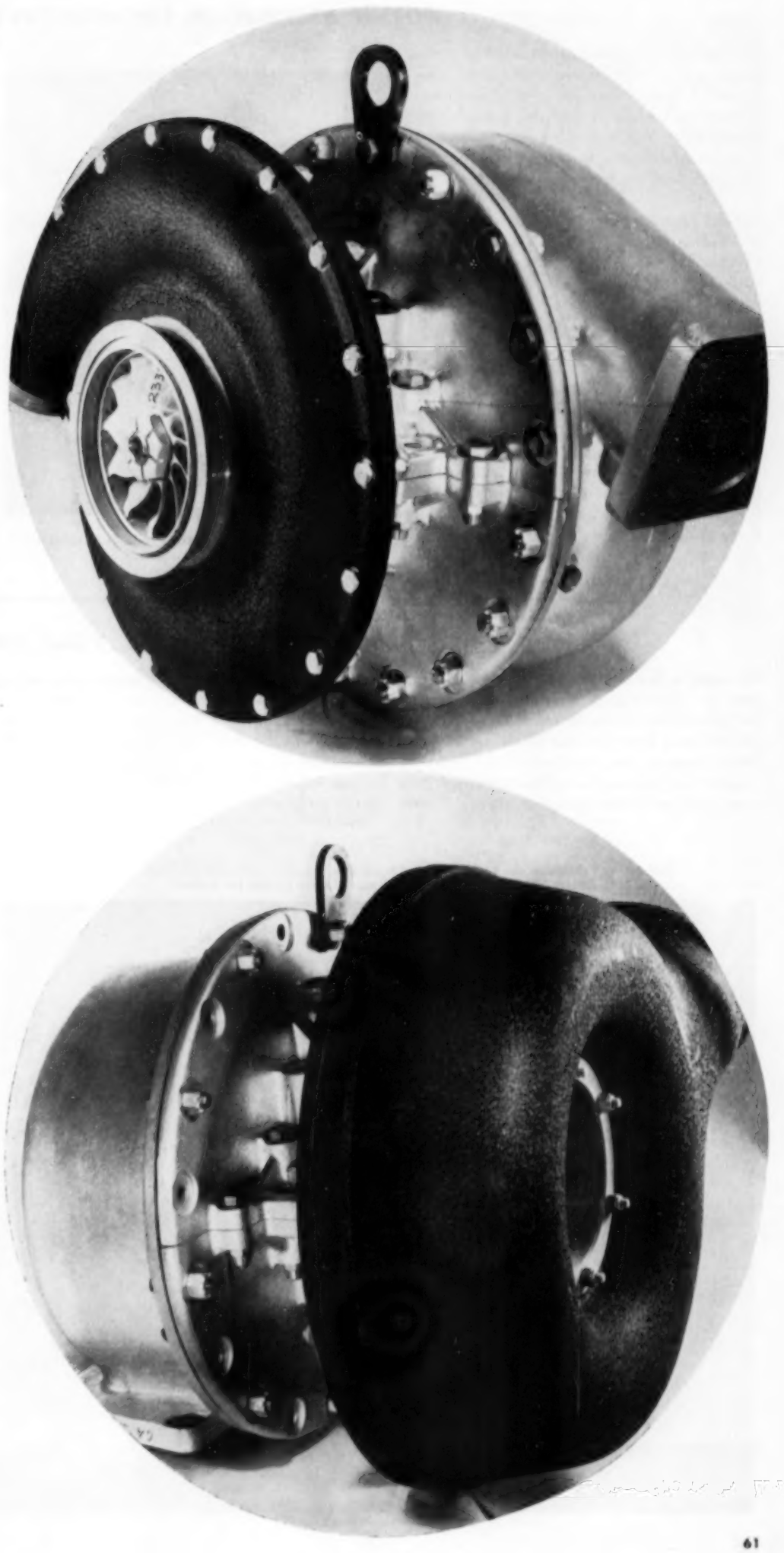
Even when operating with increased power outputs, a high-efficiency turbocharger makes life more pleasant for the combustion engine. AiResearch Industrial Division brought out turbochargers combining excellent performance, reliability, simplicity, and ruggedness. AiResearch radial turbines, especially for hot compressible fluids, incorporate knowledge gained in more than 20 years. The emphasis always has been on simplest configuration, like straight blades as contrasted to the Francis-type blading, because, consistently, top efficiencies have been demonstrated without resorting to complicated blading.

After extensive studies, sufficient component testing, and long and severe endurance testing had been completed in AiResearch facilities, a few experimental units went into thorough testing in Caterpillar's laboratories and on Caterpillar vehicles, both of the track-laying and the rubber-tired type. Only very minor and few improvements, resulting from better adapting these turbochargers to the respective diesel engines, were found to be necessary, and one of the first few units ever built operated satisfactorily on a Caterpillar dirt-moving bulldozer for over 1800 hours within ten months.

These units consist essentially of a compressor with fully-shrouded, backward-curved impeller followed by a vaneless diffuser and a 360° volute. The turbine wheel, of the 90° radial type, is surrounded by a simple nozzle ring, being an exchangeable part for purposes of adaptation to different engine ratings and placed inside the turbine torus. Compressor and turbine wheels are mounted overhung on a common shaft rotating in two plain bearings, one of which incorporates small thrust shoulders. For smooth and reliable operation, the critical speed of the rotating group is naturally much higher than the maximum rated speed. The rotating group in its bearing carrier, which also contains the sealing provisions preventing oil from entering compressor and turbine, is held in the center housing to

**Assistant Chief Engineer, AiResearch Industrial Division, Garrett Corp.*

Exterior view of the AiResearch Experimental Turbocharger Model T30. Next larger size than the model shown below it, it provides about twice the through-flow.



which the compressor and turbine housings are bolted. These experimental units were not tailored to any specific engine installation; they were rigidly mounted on available surfaces on the engine structure by means of a pedestal attached to the center housing. The T15, covering through-flow rates from approximately 20 to 60 lbs./min. and rated density ratios of 1.5, has a total efficiency above 55% which results in very desirable conditions for the diesel engine. The next larger size, AiResearch turbocharger T30, for about twice the through-flow of the T15 and the same density ratio with an over-all efficiency of 62 to 64%, may well be termed an interesting unit. The second experimental unit of this type built has, at the time of this writing, been in constant, trouble-free, high-load daily use for over 4500 hours. So far, no maintenance was found necessary. Another unit has undergone long-time, severe endurance running without distress; others are still being tested under field operating conditions.

Aside from the fact that the critical components of such equipment developed and built by the Garrett Corp. are always subjected to severe whirl testing, these turbochargers have been tested for hundreds of hours at speeds 10% higher than encountered under maximum diesel engine ratings without difficulties. Whereas the majority of turbochargers now marketed have their own independent oil supply system or require special arrangements, the AiResearch turbochargers use oil tapped directly from the diesel engine. Furthermore, they have no water-cooling and were found to do well without one.

Following this first phase, a few dozen preproduction turbochargers were produced with further simplifications found desirable during the early testing. Simplifications included the elimination of the mounting pedestal and using the turbine housing's inlet as the turbocharger's base for rigid attachment to the engine exhaust manifold, and a simpler compressor housing. These units were placed in wider field use on earth-moving jobs, in stationary powerplants, and on a switcher locomotive. They have accumulated thousands of hours of good operation in these applications.

In the past, AiResearch turbochargers have been tested and used only on four-stroke cycle diesel engines up to rather high bmep values. With the high over-all efficiencies and the low moment of inertia rotating groups—a side benefit of simple wheel configurations—no basic difficulties are anticipated when adapting such turbochargers to two-stroke cycle diesel engines. And, of course, further improvements, simplifications, keeping up with the growing demand in density ratio and for greater universality are headlines of continuous working.

Preproduction AiResearch Turbocharger T15 covers through-flow rates from approximately 20 to 60 lbs. per minute at rated density ratios of 1.5.

JOINS AMERICAN LOCOMOTIVE CO.

The appointment of Rear Admiral Wilson D. Leggett, Jr., USN (ret.), former chief of the Navy's Bureau of Ships, as vice president of engineering of American Locomotive Company was announced recently by P. T. Egbert, Alco president. Admiral Leggett's appointment became effective upon his retirement from the Navy on March 31..

Admiral Leggett reported for duty in the Bureau of Ships as deputy chief in January, 1951 and served since August, 1953. Under his leadership, nuclear propulsion for ships became a reality with the completion of the Navy's atomic submarine, the *Nautilus*. Other achievements during his tenure as Bureau chief include the construction of the *Forrestal* class of aircraft carriers and many other new fighting ships of postwar design. Mr. Egbert said, "The new dimensions involved in commercial application of nuclear power, in the design and construction of missiles, and in other striking new developments underscore the basic importance of the engineering contribution to a company which is expanding into new industrial markets. Admiral Leggett's extensive experience in a wide range of engineering responsibilities, as well as his skill as an administrator will materially assist this company in its expansion program."

Rear Admiral Wilson D. Leggett, Jr., USN (ret.)

Prior to 1951, Admiral Leggett was commanding officer of the U.S. Naval Engineering Experimental Station, Annapolis, Md. He served overseas with great distinction during both World Wars and was particularly commended for his skillful organization and supervision in the Pacific Theater, of an effective repair program for battle-damaged fleet units which enabled them to return to combat in minimum time. Admiral Leggett's decorations and awards include the Legion of Merit and the Commendation Ribbon. He was instrumental in initiating and completing a program of diesel engine development which completely freed our Navy of dependence on German designs and made possible the diesel-electric propulsion which proved so successful in World War II.

Admiral Leggett is a member of the Society of Naval Architects and Marine Engineers, the American Society of Naval Engineers, the Society of Marine Engineers, the Newcomen Society and the Naval Order of World War.

6000 GPM CAPACITY FIRE BOAT

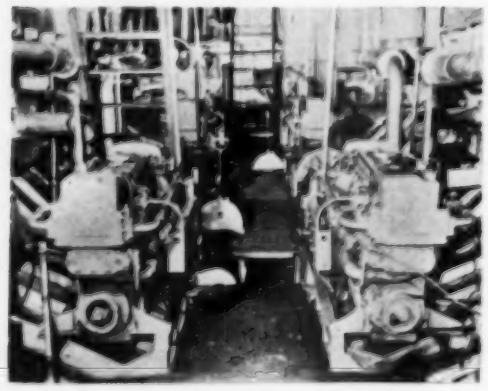
Obtaining a functionally complete dieselized fireboat for approximately one-third the usual cost per gallon pumped, was the recent accomplishment of Cleveland, Ohio with the launching of a new 58-foot pumper, the *Clevelander*. The craft was designed and built by Paasch Marine Service, Erie, Penn. and has a total pumping capacity of 6000 gpm. Four General Motors 6-71 marine diesels provide power both for pumping and propulsion. Each diesel drives a Fairbanks-Morse centrifugal pump which delivers water directly to one of four monitors at the rate of 1500 gpm at 140 pounds pressure. Flooded suction lines eliminate any necessity for priming.

Just for an exhibition the *Clevelander*, with all four monitors wide open, is here shooting water 200 feet into the air at the rate of 6,000 gallons per minute.

Propulsion power is provided by two of the diesels which also operate pumps by means of front power take-offs. The craft has a cruising speed of 12 and a top speed of 14 mph. The Great Lakes Diesel Co., Cleveland, engineered the craft's pumping and propulsion facilities and supplied both the engines and the pumps. The boat, the second in the city's fire fighting service, is 58.4 ft. in length, has a beam of 13 ft., a 6.4-ft. draft and is of steel construction. She has remote engine controls, radio, a 32-volt lighting system, automatic hot water heating and is equipped to pump into shore lines when needed.

Although the primary purpose of the craft was to supplement fire fighting facilities along Cleveland's extensive water front, she is also used in fire prevention work. One of her daily tasks is to convoy tankers loaded with hazardous products such as oils and gasolines through the winding maze of the Cuyahoga River.

Engine room of the *Clevelander* showing her four GM Diesel pumping and propulsion engines. Units in foreground operate Fairbanks-Morse centrifugal pumps. Aft engines operate similar pumps by means of front power take-offs and in addition serve as propulsion units.

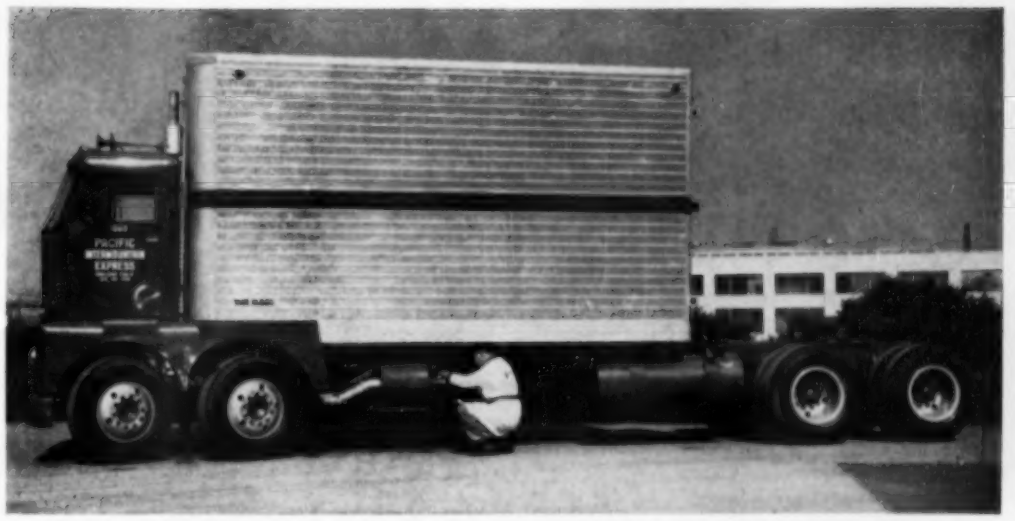


EXPERIMENTAL TRACTOR

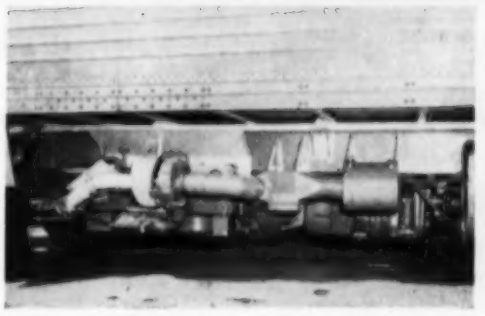
Pacific Intermountain Express has been causing many a head to turn as its experimental tractor, Model XD-30, makes its test runs between Denver, Colo., and Oakland, Calif. When the driver turns the steering wheel, four front wheels turn. "People think they are seeing double," says the driver. And they are, for tandem front axles, connected to the steering apparatus, is the observable feature of the three innovations in the rig.

Another feature is the turbocharged "pancake" Cummins diesel, mounted underneath the box instead of under or in front of the cab. The Model NHHT-6 Cummins develops 235 hp. The flat-type engine amidships is being tried to achieve better weight distribution and for easy accessibility in maintenance.

Air suspension springs are used on the tractor. P.I.E. introduced these "cushions" last fall when it acquired an entire new fleet of van-type trailers. (See DIESEL PROGRESS, December 1954.) The box on the tractor carries 10,000 lbs. of freight. P.I.E.'s original "dromedary" carried 4000 lbs. in its "hump." Weight distribution was also the objective in originating this design.



A. K. Humphries, president, says the Model XD-30 was built in the Denver shop of the company, but that a second prototype model is being constructed by an outside manufacturer. He says that if continuous tests prove as satisfactory as early runs indicate, an order will be given for an outside manufacturer to produce the tractors in quantity for operation west of Denver.



OGP CONFERENCE JUNE 6-9

The Oil and Gas Power Division of the American Society of Mechanical Engineers is holding its 27th Annual Conference and Exhibit in the Hotel Statler, Washington, D.C., June 6-9 inclusive. Location and generous cooperation of the Military Services, not only in making local arrangements but in active participation in the technical program, suggested the theme of this Conference—"Oil and Gas Power for National Defense." Prominent Military and Marine authorities will draw on their diesel experience, both in technical papers and panel discussions. Highlighting the technical sessions will be C. G. A. Rosen's personal presentation of his paper on Diesel Engine Developments—a combined history and forecast of the diesel engine. Mr. Rosen is widely known as engineering consultant to the President of Caterpillar Tractor Co. and 1955 President of S. A. E. Advance bookings promise the largest and most diversified group of exhibits yet seen in OGP Conferences.

The Washington Section is taking full advantage of local attractions to prepare an interesting and exciting program for the women. It is hoped many wives will attend. Social events for the entire group are also planned.

The tentative program follows, subject to minor changes and the addition of a nationally prominent banquet speaker.

Monday — June 6

A.M.: Technical I. "Submarine Engine Development", by Anker Antonson, Fairbanks, Morse Co. "Development of a Large Two Cycle Gas Engine", by Eric Brater, Cleveland Diesel Division, General Motors.

P.M.: Technical II. "Gas Turbines for Ship Propulsion", by John McMullen, U.S. Maritime Commission.
"The Philosphy of Vee Engine Design", by Ralph Boyer, Cooper-Bessemer Corp.

Evening: Meeting of the General Technical Committee to which all registrants at the conference are welcome.
Subject—"Specifications".

TUESDAY — June 7

A.M.: Panel I. "Heavy Fuels for Gas Turbines", by Harry King and Harold Nut, USN.
Moderator, Captain Latrobe, USN.

P.M.: Panel II. "Standardization of Diesel Engines," by Capt. C. A. Peterson and Ldr. Wilford Howerton, U.S. Navy. Moderator, Captain William Dolan, U. S. N.
Evening: Annual Banquet.

Wednesday — June 8

A.M.: Technical III. "Diesel Engine Developments", by C. G. A. Rosen, Caterpillar Tractor Co., and 1955 President of S.A.E. "High Pressure Turbocharging", by Rudolph Birman, DeLaval Steam Turbine Co.

P.M.: Technical IV. "Fatigue Characteristics of New and Used Crankshafts", by Joseph L. Aringtone, U.S. Navy. "Analysis of Noise Sources in the Diesel Engine", by Kenneth R. Mercy, U.S. Navy.

Thursday — June 9

A.M.: Technical V. "Heavy Fuel Filtration", by Fred Smith, Sharples Corporation. "Cetane Improver for Heavy Fuels", by W. H. Hubner, Ethyl Corporation.

P.M.: Technical VI. "Effects of size on the Inlet System Dynamics", by Dr. D. H. Tsai, Bureau of Standards. "Marine Application of the Supairthermal Engine", by Hans Leberherr and Ralph Miller, Nordberg Mfg. Co.

ALLIS-CHALMERS DIESEL TRAINING PROGRAM

Four motorized field training units have been placed in service by the Tractor Division, Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, to bring "at the door" service training on the new Allis-Chalmers diesel engines to the company's industrial dealer service organizations.

A unit with two-man crew is assigned to each of the company's industrial sales and service territories. Assistance is given in the territories by company branch service personnel. The training is supplementary to the all-inclusive service instruction Allis-Chalmers provides at its Industrial Training Center in Springfield, Illinois.

Each unit carries a tear-down engine which permits dealer service people to rebuild Allis-Chalmers diesel engines as part of thir instruction. Also included with each truck are an operating diesel engine, cutaway assemblies, sub-assemblies, and visual aid facilities for a comprehensive training program.

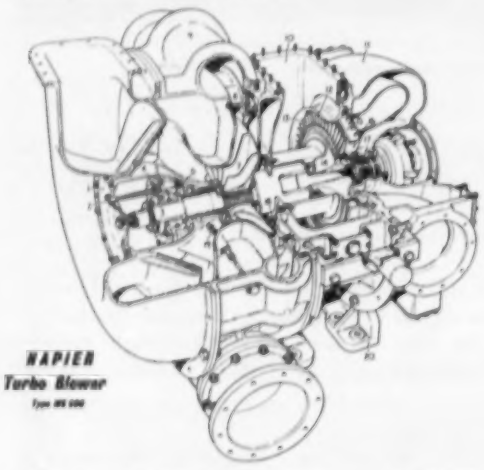
WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

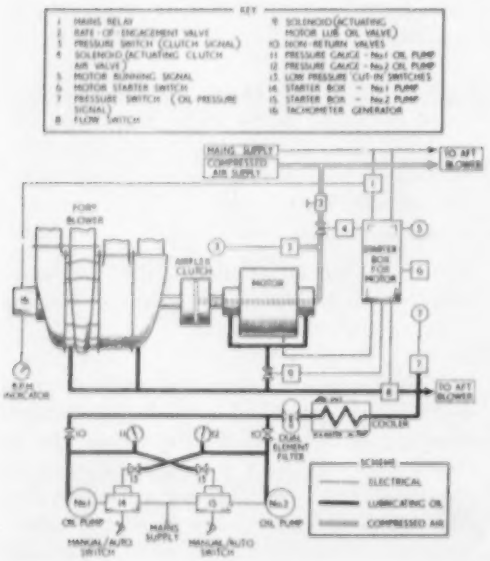
Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

TURBO-PRESSURE-CHARGING 2-CYCLE ENGINES

THE turbo-pressure-charging of four-stroke diesel engines is now widely accepted as economically successful for all but the smaller engines. Diesel manufacturers have therefore shown increasing interest in applying this turbo-pressure-charging principle to two-stroke engines.



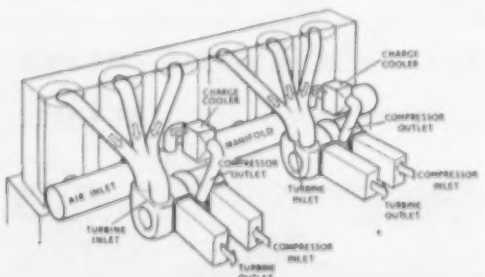
SCHEMATIC ARRANGEMENT OF CONTROL MECHANISM AND MOTORING SYSTEM



The installation of the Harland-B & W S.A.6. single-acting two-stroke engine, described in the April issue, employing two Napier Type MS600 Turbo-Blowers operating on the pulse system, is therefore of particular interest, especially since it is one of the first two-stroke engines with piston-controlled exhaust ports to be successfully turbo-pressure-charged without the assistance of mechanically-driven scavenge pumps. In the pulse system, the capacity and arrangement of the exhaust pipes between the cylinders and the turbine are controlled in design volume and area so as to use the maximum exhaust energy available on release from the cylinders. It is, further, essential to arrange the lay-out of the exhaust pipes so that pulse interference is avoided and also to permit the exhaust manifold pressure to drop sufficiently between successive pulses to allow an adequate quantity of scavenge air to pass through the cylinders, thereby removing the residual exhaust gases and reducing thermal stresses by cooling the piston and the combustion space.

The two blowers are mounted on the back of the engine, each turbine being driven independently by the exhaust from three adjacent cylinders, whereas the air delivered from the two compressors is fed to a common engine induction manifold through separate coolers.

The Napier turbo-blower consists of four casings bolted together to house a single-stage axial-flow turbine and a centrifugal air compressor, mounted on a common shaft. The turbine casings have internal water jackets that are connected to the engine cooling system. The rotor assembly is supported in plain sleeve-type bearings mounted in spherical housings which permit some universal movement in sockets in the casings, and also facilitate maintenance of the bearings; these can be removed without disturbing the casings. The bearings are pressure fed from an auxiliary-driven pump that delivers oil to connections on the end covers, the oil returning to an external reservoir through large connections at the lowest points on the covers. In the H. & W. installation, the blowers are equipped with trunnion mountings in addition to the mounting brackets. These enable the blowers to be swung through 90 deg. from the normal position if required, so that during overhaul components can be removed by a vertical lift. An air filter/silencer may be fitted in place of the compressor inlet casing; this provides ten filter panels that may be removed one at a time for cleaning while the turbo-blower is operating.



EXHAUST AND AIR INLET MANIFOLD ARRANGEMENT FOR PULSE SYSTEM ON HARLAND AND WOLFF S.A.6. OPPOSED-PISTON TWO-STROKE ENGINE

OPERATION. Under slow running conditions, when both the temperature and pressure of the exhaust gases are low, the energy released may be insufficient to maintain the turbo-blower output. This condition is aggravated during astern running when the air shortage due to the effect of the crank-angle phase difference on the astern port timing further diminishes the available exhaust energy. The blower is therefore fitted with a direct current motor that is automatically energized and engaged with the turbo-blower rotor shaft through an air-operated clutch below approximately 1,800 rpm to ensure adequate output until the blower is self-suporting. The blowers (and the blower driving motors when they are running) are pressure fed with lubricating oil from a self-contained system using a dual-element filter and a cooler.

When the engine-room comes on 'stand-by', one of the lubricating oil pumps is started and set to automatic control; the supply passing to the turbo-blower, but not to the driving motors until they are started through their respective starter boxes. As each driving motor is started, contacts in the starter box simultaneously actuate two solenoid valves, one opens the lubricating circuit to the motor bearings, and the other admits air to the clutch, so en-

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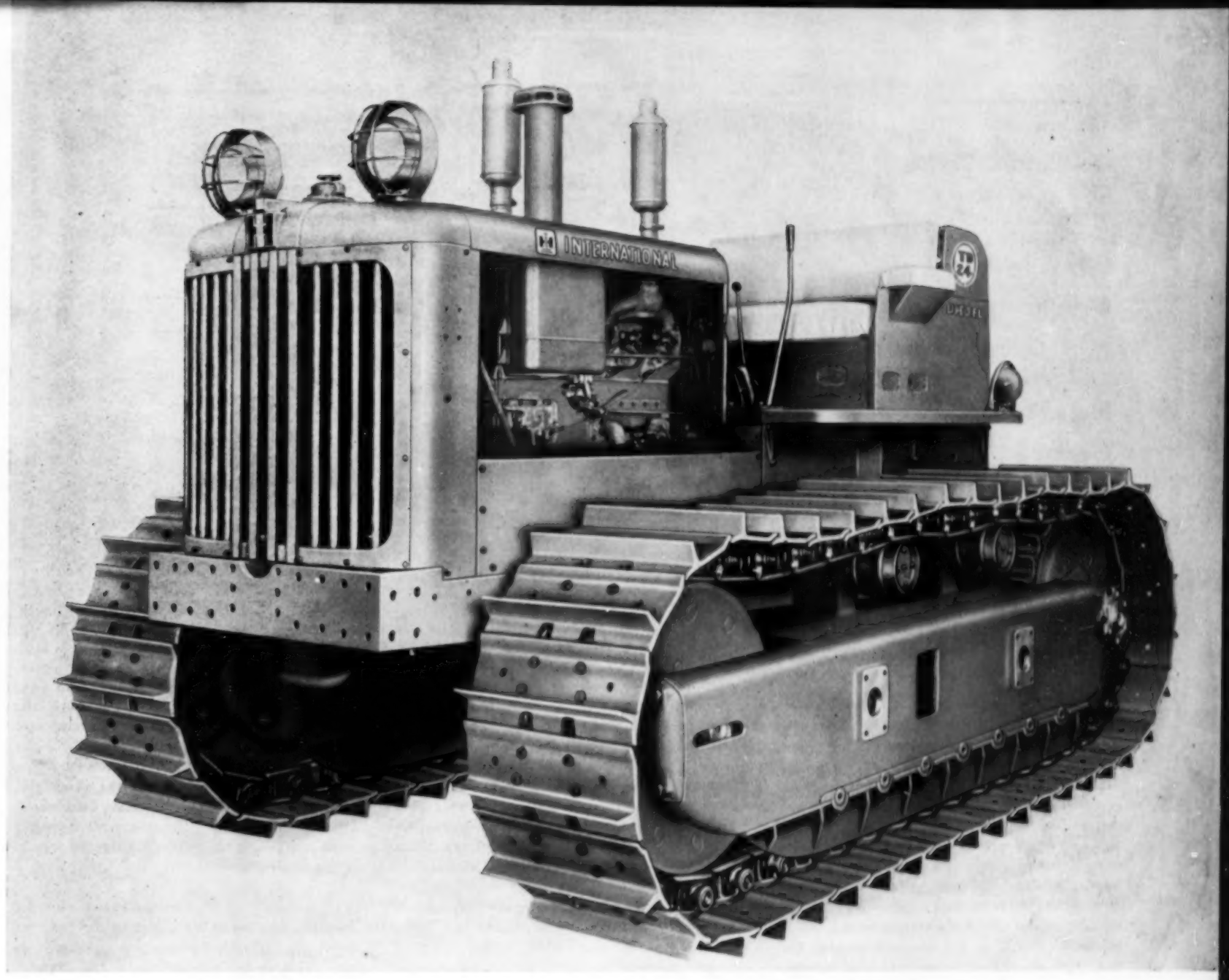


INTERNATIONAL HARVESTER'S NEW TORQUE CONVERTER TRACTOR

INTERNATIONAL Harvester Company now has a new TD-24 Torque Converter diesel crawler tractor in production at its Industrial Power Division plant in Melrose Park, Illinois. The TD-24 is the largest crawler in the International line, the standard direct-drive model having 161 drawbar horsepower with eight speeds forward and eight speeds in reverse.

The new torque converter model has four-speed ranges forward or reverse, with drawbar pull performance as shown in the accompanying chart. The new torque converter transmission system has all the shock absorption and automatic load matching advantages associated with a hydraulic drive. In addition, it has an instant high-low range planetary power shift that further reduces manual gear shifting and which also enables steering with both of the tracks pulling.

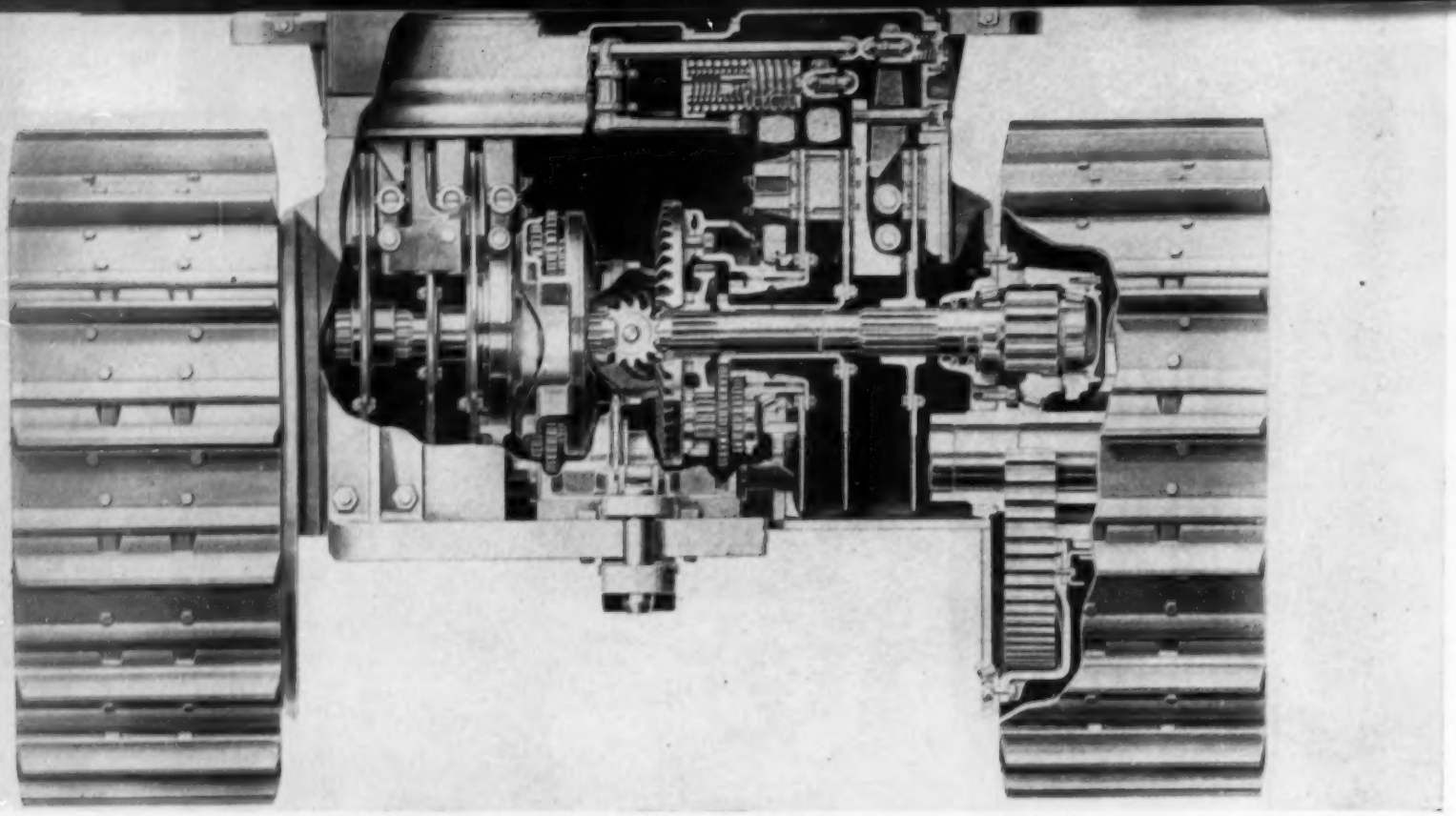
Editor's Note: This second article on the new International Harvester TD-24 tractor is being published because incorrect illustrations and information appeared in a similar article in our April issue. We regret the inaccuracies and are happy to reprint this version which contains considerable additional information.

A number of preproduction TD-24 torque converter tractors have been in the field for nearly a year working in logging operations, strip mining, land clearing, pusher loading, and various earthmoving and highway jobs. Operators have been very high in their praise of the performance, according to International Harvester officials.

The International diesel engine in the torque converter TD-24 has been stepped up from the 190 net horsepower at 1400 rpm in the standard tractor to 200 net horsepower at 1500 rpm at the engine flywheel. Other improvements include intake and exhaust valve rotators, new pistons with all five rings above the piston pin, a new top compression ring which is chrome-plated and keystone shaped, and a new chromed upper oil control ring.

The engine is naturally aspirated 4-cycle, 6-cylinder, 5¾-inch bore and 7-inch stroke, with push button all weather gasoline conversion starting system. It features a new engine oil temperature stabilizer and a new rectangular United Specialties air cleaner 17 percent larger than previous cleaners. The new air cleaner is mounted on the left side of the engine and provides for more efficient engine performance in severe operating conditions together with more room and operator visibility.

The torque converter is a Twin Disc 3-stage model with a torque multiplication ratio of 4.83:1. It is



Cross-sectional view through rear of International TD-24 torque converter tractor showing planet power steering system. Each track has its own two-speed planetary transmission controlled hydraulically by a separate lever. For steering purposes, one track is put in high and the other in low range to give power on both tracks in a gradual turn. Pivot turns and "feathered" turns are also possible, as with conventional steering clutches.

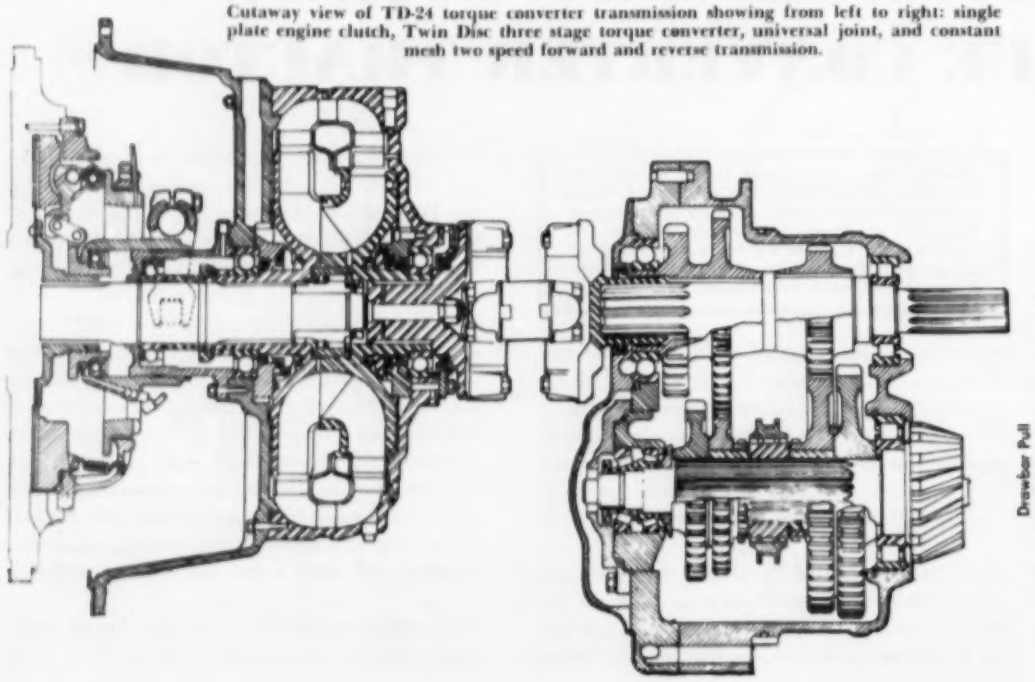
mounted as an enclosed unit with a 17-inch over-center type clutch on the engine. The torque converter hydraulic system is connected to the engine fuel system. The supply pump is driven by the engine generator and takes filtered fuel from a tee at the auxiliary fuel filter outlet and pumps it into the torque converter oil inlet tube. A relief valve set at 45-60 psi prevents excessive pressure from being built up within the torque converter. Expanded fluid and any entrapped air in the system escapes from the main fluid circuit through a .051-inch orifice and filter element assembly located on the left-hand side of the torque converter. This fluid, together with the return fuel from the injection pump, then flows back to the tractor fuel tank. It is this fluid which the supply pump replaces in the torque converter.

Another feature in the torque converter is an over-running clutch. This clutch free wheels at all times except when the output member, or turbine, of the torque converter revolves faster than the input member, or impeller, such as occurs when the load pushes the tractor in descending steep grades. The over-running clutch then automatically engages and effects a direct mechanical connection between the transmission and engine clutch.

The torque converter is used in conjunction with a 2-speed, constant-mesh gear transmission and a 2-speed planetary gear steering system. Since the torque converter impeller is driven from the engine flywheel through a conventional single plate 17-inch over-center friction clutch, it is possible to disconnect the power train and shift transmission gears in the conventional manner. The clutch lever has a pull of only 15 pounds for maximum ease.

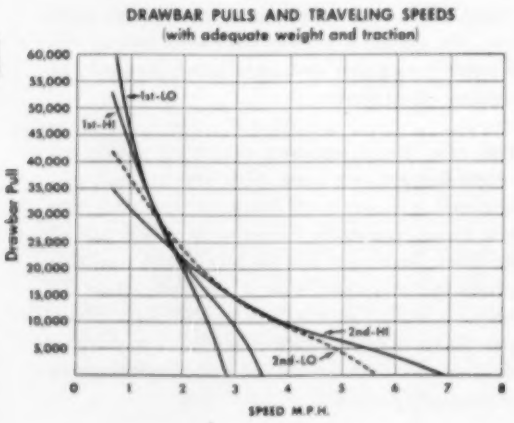
A large double universal joint connects the torque converter to the transmission to take off any misalignment that may occur with heavy front-mounted tractor equipment. The two speed ratios forward and two in reverse are individually selected with a single-gear shift lever.

The transmission is an independent unit assembled into the rear main frame and driven by spiral bevel gears into the "planet power steering" system. This system provides an instant high-low power shift which, combined with the constant mesh transmission, gives the tractor four-speed ranges forward and four-speed ranges in reverse.



Cutaway view of TD-24 torque converter transmission showing from left to right: single plate engine clutch, Twin Disc three stage torque converter, universal joint, and constant mesh two speed forward and reverse transmission.

This graph shows the drawbar pull for the TD-24 torque converter tractor for all gear ranges. The two sets of curves represent the two different gear ratios in the transmission and the two planetary steering system gear ratios for each transmission gear ratio. The drawbar pull is only calculated up to a point where the tractor is moving fast enough to be actually doing work.



Planet power steering is a feature carried over from the standard Model TD-24. In conjunction with the torque converter, it offers a maximum of ease and exactness of control. The system is hydraulically controlled and allows a 1.27:1 instant gear change by a flick of the two hydraulic steering control levers. This feature makes it easy for the operator to get into the most efficient speed range for the particular job he is performing. Also, gradual turns with power on both tracks can be accomplished as well as the conventional pivot turns with all power on the outside track.

Steering with power on both tracks is very important when considering maximum drawbar pull because, to get the maximum pull, the full weight of the tractor must be utilized. The only way this can be accomplished for turning is when power and torque is being transmitted to both tracks.

There is also a decelerator pedal that is operated by the left foot. This pedal works just the reverse of an automobile accelerator and allows the operator quickly to adjust the speed of the tractor with both hands free for instant use on other controls.

This is advantageous, for example, in pushing when the tractor must be quickly maneuvered into position for a smooth push contact. Also, when dozing a load over a cliff or embankment, the tractor speed, direction of traveling, and blade position need to be closely controlled simultaneously. The decelerator pedal is also useful in slowing engine speed for making smooth and quick gear changes in the constant-mesh transmission. The single transmission control lever is designed so that it is easy to go from low forward range to a high reverse or vice-versa in order to speed up time cycles.

Because of the frictional losses in a torque converter hydraulic system, it is necessary to provide for cooling of the torque converter fluid. This is done in the new TD-24 by a large heat exchanger mounted on the tractor frame at the left side of the engine and cooled by a large volume of water circulated through it by the engine water pump. A special heavy-duty tractor radiator is used for increased cooling capacity. Also the radiator guard provided for use with cable and hydraulic control dozers have a new louver arrangement to allow unrestricted flow of air through the radiator.

The TD-24 torque converter tractor can be used to advantage in many types of jobs and particularly on jobs requiring tremendous drawbar pull. Moreover, the torque converter absorbs shock loads to the engine and drive components through its fluid action, thus increasing engine life and decreasing maintenance problems. In addition, it automatically matches drawbar pull to the load requirements thus reducing the amount of gear shifting. A big advantage on some jobs is that it eliminates engine stalling under load.

Some illustrations of jobs where the TD-24 torque converter is particularly advantageous are as follows: In pusher loading or dozing, the torque converter and planetary steering combination allows the tractor to achieve the highest possible speeds because the torque converter automatically and instantly adjusts itself to the load requirements. In

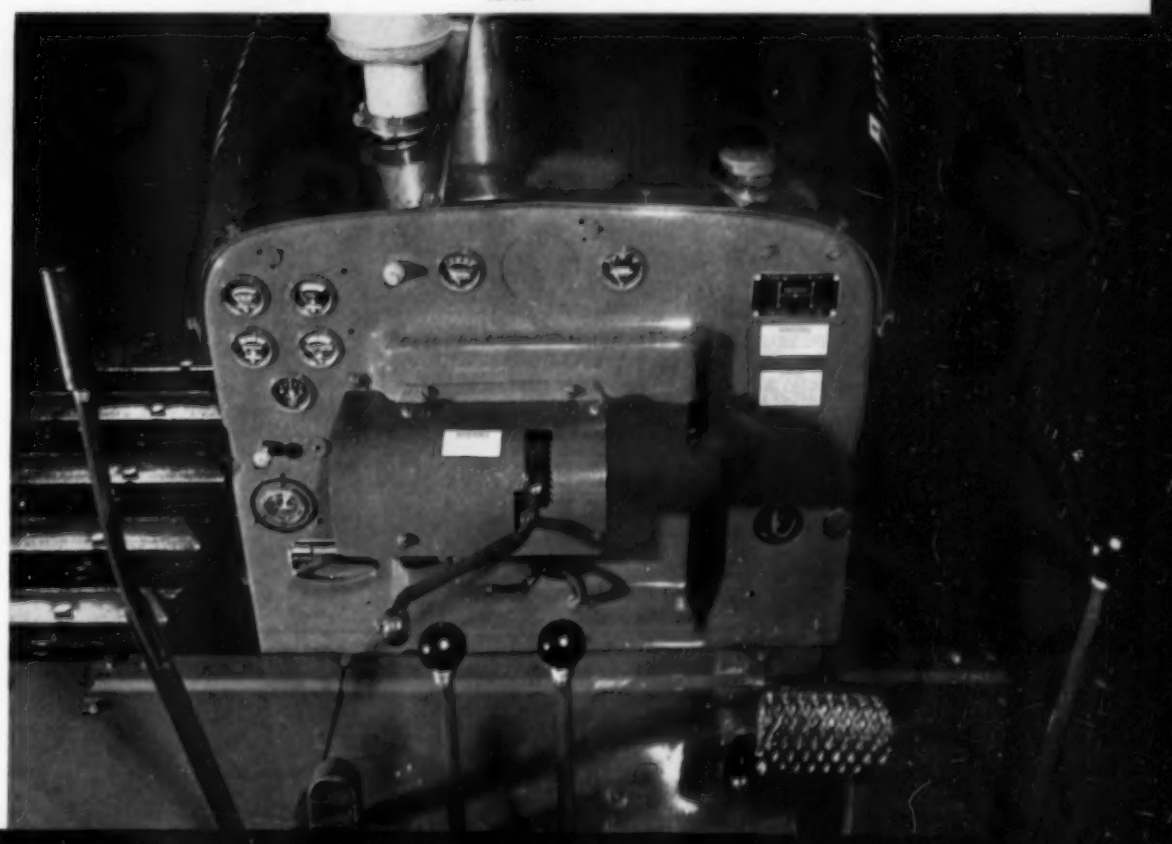
The International TD-24 torque converter tractor in action, bulldozing on a highway grading project in Illinois.

pipelaying, the control features of this tractor are important because smooth power transmission is necessary in positioning and laying the pipe. The torque converter eliminates engine stalling which can easily occur with a conventional transmission when a heavy load is closely controlled—a necessary factor in pipelaying work.

Other features in the new TD-24 include a fuel tank that has been increased from 85 to 135 gallons capacity and a standard 24-volt electric starting and generating system is used in place of a 12-24-volt system. Batteries are located in accessible positions in pairs on each side of the engine. Hood side plates have been shortened to permit more elbow room in the engine compartment.

Operating weight of the TD-24 torque converter tractor with 22-inch shoes, seven roller tracks, and regular price coded equipment is 42,710 pounds. When equipped with radiator and track roller guards and 24-inch shoes, the weight increases to 44,000 pounds. The application of dozers further increases the weight to well over 50,000 pounds, so that actual drawbar pulls of 45,000 pounds and more can be accomplished at a traveling speed of approximately one mile per hour not only while going straight ahead but also when steering.

Operator's view of his controls, left to right: engine clutch lever, decelerator pedal, planetary gear steering system control levers, mechanical foot brake, and transmission control lever.



West Coast News

By James Joseph

FOR MARYSVILLE, Calif's Baldwin Contracting Co., a new Madsen 6000-lb., model 481 batch plant at Lemon Cove, Calif. Two Murphy diesel generators (Model M-4 and 124) supply power to the Madsen tower unit, to a Madsen 84-in.x52-ft. aggregate dryer and to a Madsen #380 dust collector. A Caterpillar D-17 V-belt drives the batch type twin-shaft pugmill mixer. And a D-318X Caterpillar operates the dust collectors.

TO LEICH SALES Corp., West Los Angeles, two Fairbanks-Morse 180 hp, 6 cylinder Model 49B4½ engine-driven generating sets.

RECENTLY PUT into operation at the Seward (Alaska) Electric System, a Cooper-Bessemer LS-8, turbocharged diesel engine driving a 1200 kw, GE generator.

ANOTHER COOPER-BESSEMER engine, a Model JS-6-DR, was recently purchased by the Vancouver Tugboat Co., Ltd. (Vancouver, B.C.) for their tug *La Garde*.

FOR BOEING AIRPLANE CO.'s preflight facilities at Larson AFB, Moses Lake, Washington, a Cummins 300 kw generator set for emergency power. Generator set is powered by a Cummins model VT-12-I engine. Included, too, are three Cummins model NHRIS-600-F fire pumps.

TO UNITED TRUCK Lines, Spokane, Wash., 76 of the new Cummins NT-6-B turbodiesel engines for conversion of the company's present operating fleet. Sales by Cummins Diesel Sales, Inc., Spokane.

PRESENTLY BEING INSTALLED in the tugboat *Queen*, at Vancouver, B.C., a Cooper-Bessemer Model JS-6DR engine. Boat is owned by Cliff Towing Co. Ltd.

CUMMINS DIESEL Sales of Alberta, Ltd. has installed a Cummins Model NVHI-1200 engine on an "Oilwell" Model 48PHD Triplex oil well fracturing pump for Edmonton, Alberta's Eskimo Fracturing & Well Service Co.

AT WEYERHAEUSER Timber Co.'s Vail-MacDonald Camp, a yarder has been converted to a Cummins NVHI-1200, 400 hp engine. This is fourth Cummins "V" series engine used in yarders by Weyerhaeuser.

SOLD BY Anderson-BeVier Co., Inc., two 50 hp Buda diesel engines to Salyers Equipment Co. (Los Angeles) for emergency generator sets for Doheny hospital.

TO M. D. STEINBACH, Sutherlin, Oregon, a Buda diesel for his truck used in over the highway logging.

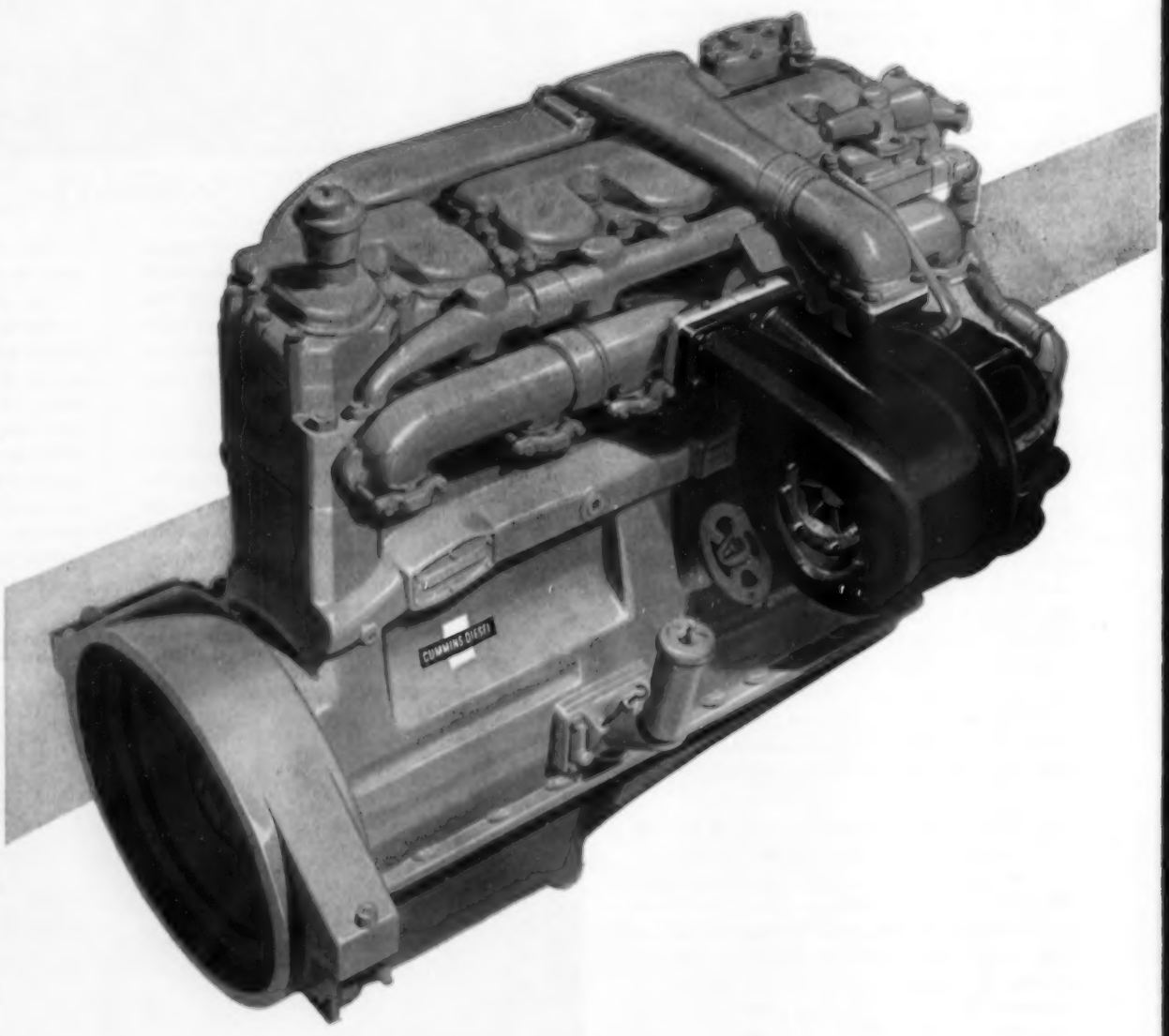
FOUR NEW MODEL HD-21 Allis-Chalmers crawler tractors, powered by DS-844 Allis-Chalmers Buda Division diesel engines, have been sold to Menasha Plywood Corp., North Bend, Ore. for use at the company's Allegany operation. Sale: thru Pape Brothers, whose sales outlets are located in Eugene, Roseburg and North Bend.

THREE LTSW MACK TRUCKS powered with 6DA-844 Buda diesels have joined a 13-truck fleet of LHSW and LTSW Macks operated by Morrison-Knudsen Co., Boise, Idaho, at the contractor's Soda Springs project.

GARRETT FREIGHTLINES, Pocatello, Idaho, has taken delivery of 10 Kenworth trucks powered by 6DAT-779 Buda diesels, for use out of the trucker's Pocatello office, for general freight haulage. An additional 10 6DAT-779s have been ordered as replacement engines for the same fleet.

TO BOOTH-KELLY LUMBER CO.,

NEW TURBODIESEL



Springfield, Ore., for their Mosby Creek operation—three model 524 Kenworths, sold thru Portland's Roberts Motor Co. Kenworths are powered by 6DAT-779 Buda turbo-charged engines.

Stanodiesel Oil M

Standard Oil Company (Indiana) announces a new product, Stanodiesel Oil M, which will replace Standard HD Oil and which will become the preferred recommendation for stationary industrial engine lubrication. It will be available in grades No. 10, 20, 30, and 40. Grade No. 45 now available in the Standard HD line will not be included in the new line and all requirements for that grade will be filled from Grade No. 40.

Stanodiesel Oil M represents an up-grading of the older line of diesel engine lubricants. Its development grew out of a need to keep abreast of the increasing lubrication demands of new engine designs. It incorporates a more recently developed additive superior but compatible with the Standard HD oil. The detergent-dispersant ability of the new oil is substantially greater than that of the old. Oxidation inhibitors are incorporated to enhance the already fine stability of the high viscosity base stocks. A special wetting agent is included.

The manufacturer states that Stanodiesel Oil M will result in cleaner crankcases, pistons, cylinder walls, and other internal engine parts.

International 4-in-1 Skid Shovel Described

The versatile new International Drott Four-In-One Skid-Shovel is described in a catalog just published by Drott Mfg. Corp., Milwaukee, Wis. Whether the unit is moving or standing still, the operator merely by placing the "shovel selector" in the desired position, can convert the Four-In-One into a bullclam shovel, a bulldozer, a skid-shovel or a clamshell.

As a bullclam shovel, especially useful in sanitary landfill operations or transporting dirt on short hauls, grading and leveling is accomplished with a special depth control gauge. With the clam open, the unit becomes a bulldozer. In the Skid-Shovel position, the Four-In-One has same rollback at ground level as the standard International Drott Skid-Shovel. To pick up stockpiled or other loose materials in close quarters, the operator sets the "shovel selector" in the clamshell position. When loading and transporting, the bucket may be rolled and semi-skidded on the ground as in Skid-Shovel operations.

In addition to the four shovel variations, the versatile Four-In-One may be used as a backhoe. The Four-In-One designed for use with the International TD-6 crawler is 68 inches wide and 40 inches high. The shovel holds ⅞ of a yard with lifting capacity of 3,000 pounds. The installation on the TD-9 holds 1¼ yards with lifting capacity of 4,000 pounds. It is 78 inches wide and 45½ inches high.

The new catalog contains full specifications, photographs of the Four-In-One in action, and drawings illustrating its operation. The booklet may be obtained by writing to Drott Mfg. Corp., Milwaukee, Wis.

Purchases Diesel Locomotive

The Montana Western Railway Co., Valier, Montana, has purchased an 80-ton diesel electric locomotive from Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. The locomotive is powered by two 275 hp, 6-cylinder, Cummins diesel engines, and will develop a continuous tractive effort of 24,800 pounds at 5 miles per hour with a maximum speed of 42 miles per hour.

BY CUMMINS

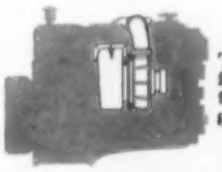
ups your performance

and lowers your costs!

Cummins 235 h.p. turbocharged NT-6 pulls full loads faster, permits higher speeds on grades, cuts running time, because it produces greater horsepower without increase in engine size or displacement. Turbocharging—which harnesses exhaust gases normally wasted—produces this extra horsepower by achieving a more perfect air-fuel mixture in the combustion chamber.

In addition, Cummins exclusive PT fuel system is simple and trouble-free . . . makes fuel system maintenance costs negligible. It is so easy to understand and work with that no specialists are needed. Fuel costs, of course, are kept at a minimum with No. 2 diesel fuel or furnace oil.

For the operator of Cummins 200 h.p. NH-600 models, a Turbodiesel Conversion Package will soon be available which will make it possible to add 35 h.p. to every unit. For further information, see the Cummins distributor in your area, or send us this coupon today.



Turbodiesel Conversion Package for NH-600 models includes turbocharger, new manifold, and gaskets.

CUMMINS

Cummins Engine Company, Inc.
Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

Cummins Engine Company, Inc.
Columbus, Indiana

Please send me detailed information on the Cummins developments checked below:

_____New NT Turbodiesels

_____Turbodiesel Conversion Package for NH-600 models.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

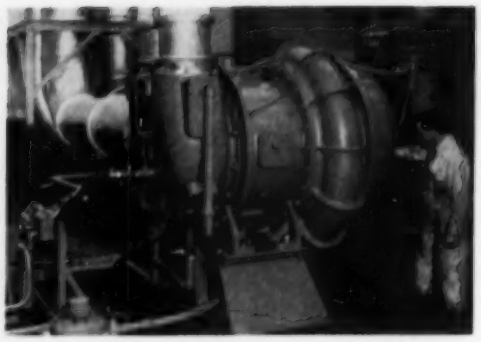
DP-4

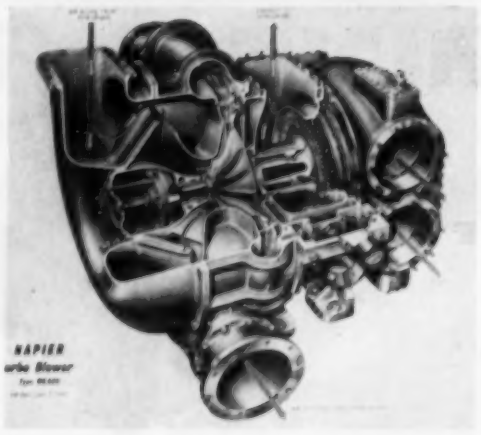
THE NAPIER TURBO-BLOWER

(Continued from Page 64)

gaging the motor with the blower rotor shaft and driving it until the diesel engine is started and its exhaust gases are of sufficient pressure to produce a speed in excess of 1,800 rpm. As this speed is achieved, the tacho-generator fitted on the compressor end of the blower generates enough voltage to operate the relay and this cuts off the power supply to the motor and closes the solenoid valve in the air line, so disengaging the clutch. At the same time the solenoid valve in the lubricating oil line shuts off the oil supply to the motor bearings without interrupting the supply to the turbo-blower bearings. This condition prevails until the diesel engine speed is reduced to the point at which the blower speed falls below 1,800 rpm, when the tacho-generator output fails to maintain the relay position and the motoring system is again brought into action.

Electric power for the system is drawn from the ship's main supply, and the air supply is taken from the engine starting reservoir, being fed to





the clutches through a pressure-reducing valve and individual rate-of-engagement valves.

NAPIER TYPE MS. 600 TURBO-BLOWER PERFORMANCE

Maximum Continuous
- Speed ..... 6,400 rpm
- Pressure ratio (nominal) 1.5:1
- Sea-level delivery pressure (G) ..... 7.35 psi

Maximum (one hour limit)
- Speed ..... 7,360 rpm
- Pressure ratio (nominal) 1.7:1
- Sea-level delivery pressure (G) ..... 10.3 psi

Maximum Turbine Inlet Temperature 1,200 deg.F

GENERAL DATA

Overall Dimensions (Approx.)

Length	Width	Height
92-in.	66-in.	70-in.

Net dry weight ..... 7,000 lb.

Oil pressure (minimum) ..... 40 psi

Operating air pressure ..... 60 to 100 psi

Driving motor ..... 10 hp

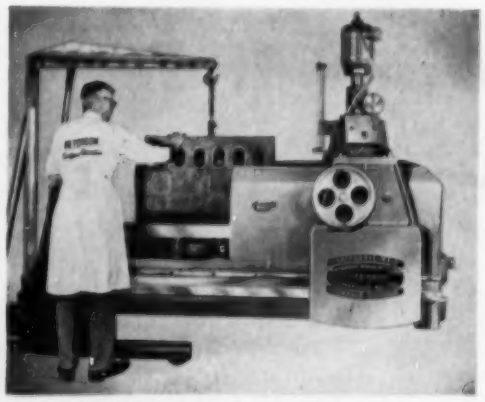
NEW, FAST UNIVERSAL WET SURFACE GRINDER BY PETERSON LABS

A new universal wet surface grinder for fast, efficient, accurate grinding and resurfacing of heads, manifolds, and blocks for both inline and V-8 type motors is now available. The all-inclusive capacity of this new wet grinder makes it practical for all sizes and types of internal combustion engines, from the smallest motorcycle up through and including the largest #13,000 series Caterpillar diesel engine.

Designed for easy loading, quick set-up and alignment, and full vision grinding and featuring the use of a 5-in. faced, flat-dressed 16-in. grinding wheel and radical new cooling system, the new wet grinder makes head and block resurfacing as much as three times faster. The machine is manufactured and marketed by the Peterson Welding Labs, Inc., of Kansas City.

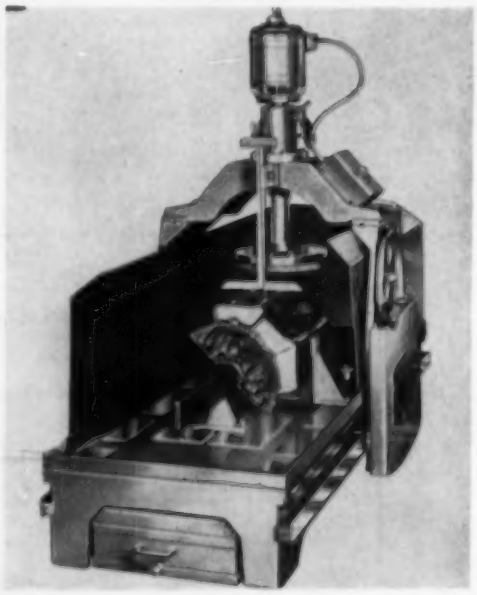
This new Peterson Universal Wet Surface Grinder permits even the largest blocks to be loaded straight down from an overhead hoist or crane. Blocks are positioned with their main bearing housings resting on a horizontal locating rail, with heads and manifolds positioned on a worktable pre-set on this same locating rail.

The locating rail runs directly beneath and per-



The Peterson Labs new universal wet surface grinder is designed for easy loading, quick set-up and alignment.

Block positioned with its main bearing housing resting on the horizontal locating rail.



fectly parallel to the path of the grinding wheel resulting in automatic longitudinal alignment of all work. Probably the most unusual single feature of the new grinder is its centrifugal-force system. With this system, coolant is forced, under pressure, down through the hollow shaft of the spindle motor and on down through a hollow spindle and over a baffle which distributes it out in all directions over the working surface. This "inside-out" action results in thorough flushing and super-cooling and permits the use of the unusually large 5-in. faced, flat-dressed, 16-in. grinding wheel.

The high degree of efficiency which results from the combined use of this over-sized grinding wheel and centrifugal-force-flush distribution of the coolant allows the new Peterson grinder to make a previously unheard-of .010-in. cut in cast iron stock in a single pass, leaving a surface finish of 30-80 R.M.S.

The construction of the ways on the machine assures extreme accuracy since they hook over and under the track and make it impossible for the carriage to lift in the grinding process. Wavy cuts are eliminated because the full five inch facing on the grinding wheel completely spans cylinder openings and avoids the tendency to dip or "bite in" at these openings and ride up at the bridges between them.

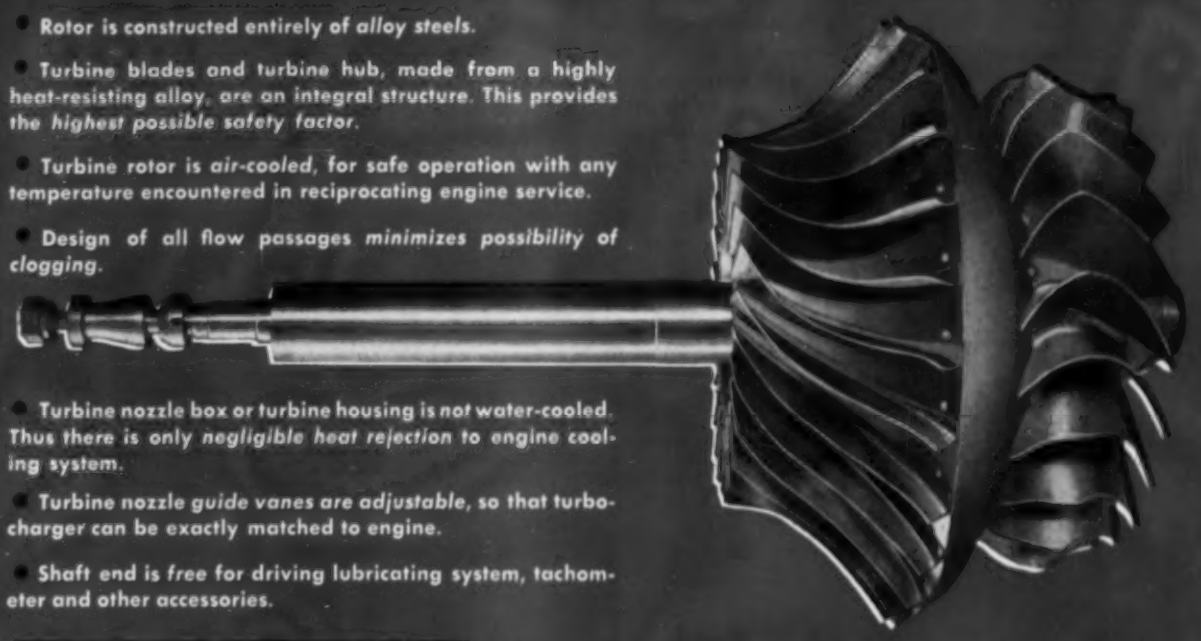
Since the machine affords a full view of the work at all times, the operator can make a quick visual inspection at any point in the operation. Of special interest to shops handling a large volume of the same motors is the automatic feed available.

A new four-page catalog sheet fully describing this Peterson Universal Wet Surface Grinder and giving all specifications is available direct from the manufacturer, Peterson Welding Labs Inc., 1423 Virginia Ave., Kansas City 6, Mo.

DE LAVAL
HIGH PRESSURE TURBOCHARGERS

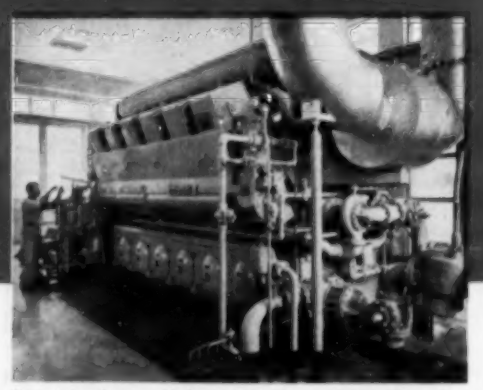
increase output by 100% or more

- Rotor is constructed entirely of *alloy steels.*
- Turbine blades and turbine hub, made from a highly heat-resisting alloy, are an integral structure. This provides the *highest possible safety factor.*
- Turbine rotor is *air-cooled,* for safe operation with any temperature encountered in reciprocating engine service.
- Design of all flow passages *minimizes possibility of clogging.*

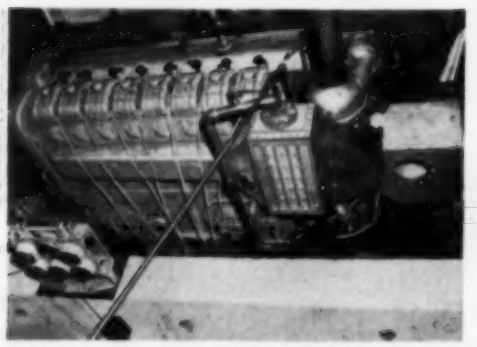


- Turbine nozzle box or turbine housing is *not* water-cooled. Thus there is only *negligible heat rejection* to engine cooling system.
- Turbine nozzle *guide vanes are adjustable,* so that turbocharger can be exactly matched to engine.
- Shaft end is *free* for driving lubricating system, tachometer and other accessories.

Exclusive
MONOROTOR
construction shows why



Here is a De Laval Type A-14 Turbocharger installed on a V 12-cylinder, 4-cycle diesel engine.



A De Laval Type B-8 Turbocharger, shown on test, is mounted vertically on an 8-cylinder, 2-cycle diesel.

These De Laval high pressure turbochargers represent the newest development in diesel engine design. In many cases they can double the output of heavy-duty diesel, gas and dual-fuel engines without increasing thermal loading. • They offer pressure ratios of 3:1 as well as far higher compressor and turbine efficiencies than those found in conventional turbocharger systems.
• De Laval turbochargers are self-adjusting to engine loads, can be used on 4- *and* 2-cycle engines. *Write for Bulletin 8000* giving compressor curves and flow range diagrams.

DE LAVAL
Turbochargers

DE LAVAL STEAM TURBINE COMPANY
883 Nottingham Way, Trenton 2, New Jersey

DL-500

CATERPILLAR'S NEW D9 TURBOCHARGED TRACTOR

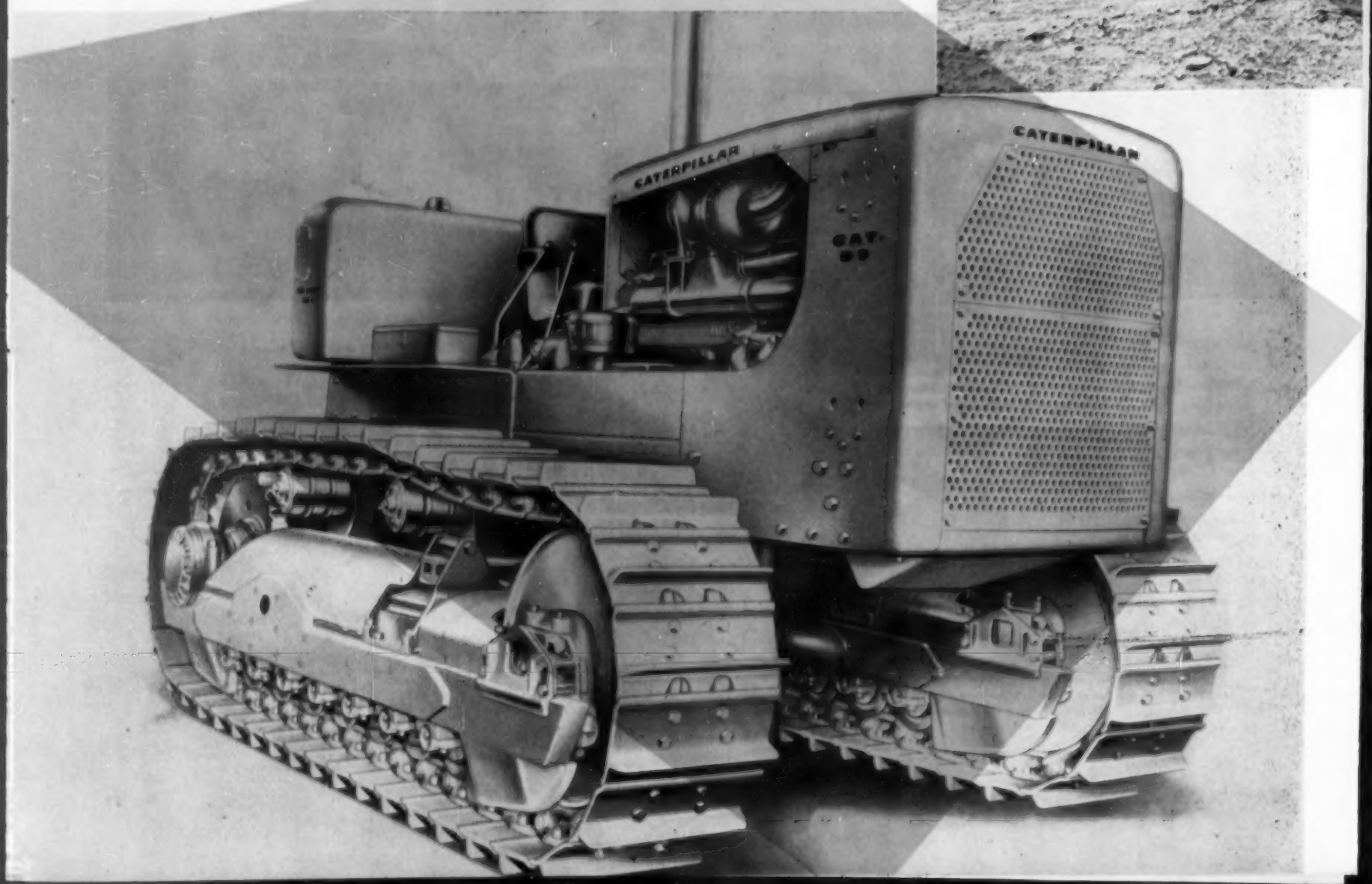
Latest Cat Crawler Delivers 286 HP at 1200 Rpm in Both Torque Converter and Direct Drive Models: Makes Sixth Unit in Company's Track-type Line: Weighs 56,000 Pounds

A 230-drawbar horsepower crawler tractor with turbocharged engine became the sixth machine in Caterpillar's track-type line on May 1. It is the Cat D9 Tractor which already has received considerable attention from construction men, loggers, mining men, and pipeliners during an extensive field testing program in 1954. Announcement of the 56,000-pound D9, climaxes 10 years of big tractor research and development at Caterpillar. The company has drawn upon 50 years of track-type manufacturing experience to produce a "light-footed giant."

A new 6¼x8, six-cylinder Cat diesel engine is equipped with a turbocharger, an advancement in track-type tractor manufacture. The tractor also will have Caterpillar's oil-type clutch or optionally a torque converter, in-seat starting, hydraulic track adjustment, excellent operator visibility and many servicing conveniences. Caterpillar officials expect the D9 will be used in virtually every track-type tractor application and particularly in general construction, logging, pipelaying, mining and quarrying. Some of the available attachments include the No. 9S and No. 9A bulldozers, push cup, front and rear cable controls.

Although the tractor is big, general appearance will conform to the other five models of Cat crawlers. Length is 17 ft. 10 in., width 9 ft. 11 in.,

This "light-footed giant" is a step forward in crawler tractors, incorporating the AiResearch turbocharger, shown in this picture. Engineers of AiResearch Industrial Division, Garrett Corp., and of the Twin Disc Clutch Company worked closely with Caterpillar engineers for many months in perfecting the D9.



One of the first test model D9s operated both as a pusher and at self-loading a scraper for the Marquette Cement Co. in Illinois. Then it went to the Guy F. Atkinson Co. in California to pull a ripper used in building Cherry Valley Dam. Such owner-operated, company-maintained D9Xs accumulated thousands of hours of operation under varied conditions to prove all innovations were practical.

height (excluding exhaust pipe and air cleaner), 8 ft. 9 in. Ground clearance is 21 in. Ninety-inch gauge will be standard as will a seven-roller track frame and fixed drawbar. A console-type control panel, seat design and location and careful arrangement of operating controls make a flat, relatively open deck.

There is a six-volt electric starter for the two-cylinder starting engine. The diesel engine, which delivers 286 hp at 1200 rpm for both the torque converter and direct drive models, shows considerable attention to external appearance. Oil lines, fuel lines and water tubes are placed internally as much as possible. Several features of the engine include (1) short valve push rods which are possible because the camshaft is high in the block; (2) stationary oil jets provide a continuous stream of oil to cool the pistons, the camshaft and followers; (3) steel-backed aluminum bearings with the lower half of the center main bearing to take the camshaft thrust on a flange-type bearing.

All accessories are driven from a gear at the rear of the crankshaft to avoid much torsional vibration. There is constant power drive for rear-mounted equipment, such as cable controls, providing power regardless of whether the flywheel clutch is engaged or when the torque converter is operating at lowest speeds. Pressure lubrication and full flow filtration are provided in the engine, the transmission, steering clutch release booster and each final drive. Pressure lubrication is provided also for the oil clutch and starting engine.

The Twin Disc torque converter is a three-stage, 5:1 torque multiplication unit using diesel fuel for the hydraulic fluid. The flywheel clutch used with the torque converter is a 19-in. single plate, dry-type. Torque converter fluid cooling is provided by a water-type heat exchanger mounted on the right hand side of the engine. Speeds up to 7.8 mph with three speeds forward and two in reverse are provided. The direct drive has six speeds forward and six in reverse ranging from 1.6 to 6.8 mph. With the direct drive transmission, drawbar pounds pull of 60,860 lbs. are possible with adequate weight to provide the traction.

Welded fabrication of the steering clutch case and main frame provides a rugged backbone for the entire tractor assembly which fits in with the severe service to which this machine will be subjected.

A one-piece welded track roller frame includes closed oil-type recoil spring housing and track guiding guards at each end of the frame. The equalizer bar rests on moulded rubber pads on the track roller frame. Heavy-duty radiator guard and half-inch thick fenders are standard equipment.

The conventional drive D9 will weigh 56,200 lbs. and the torque converter model, 56,650 lbs. The standard track shoe, heat treated for wear resistance and strength, is 24 in. wide and there are 43 shoes to each track. There will be 129 ¾ in. of track on the ground, making a total ground contact of 6,228 sq. in. Weight per drawbar horsepower is 235 lbs. Twenty-seven and 30-in. shoes are available as optional equipment if buyers desire.

Many features were designed with operator safety and comfort in mind. There are locks on both brake pedals. Pumps are mounted on the rear of the engine to provide constant power for hydraulic

actuation of brake and clutch boosters. Grab irons are mounted on the rear and sides of the fuel tank for boarding the tractor and another is on the left radiator guard for servicing the air cleaner. The deck has been cleared of all but the most essential controls and those are placed for maximum efficiency. The bulldozer cable tube for the rear cable control unit is incorporated in the right hand main frame member for safety and appearance.

Many service conveniences have been built into the D9. The hydraulic track adjuster requires only a grease gun to operate. The steering clutch and brake drum assemblies can be removed separately without distributing the bevel gear. The flywheel clutch assembly or the torque converter unit can be removed without disturbing the engine or the transmission. The transmission barrel assembly can be removed without disturbing the flywheel clutch. Brakes and steering clutches can be adjusted through easily removed top covers in the steering clutch housing. Brake band assemblies can be replaced without removing the fuel tank assembly. Removal of the engine from the tractor can be accomplished without disconnecting the gauge lines and starting engine controls, since the gauge panel is mounted on the engine.

The diesel engine is a 6 cylinder, 4-stroke cycle, valve-in-head; bore 6¼ in., stroke 8 in. The piston displacement is 1473 cu. in. Speed, governed at full load, is 1200 rpm; at maximum drawbar pull (point of maximum torque) 800 rpm. It burns No. 2 diesel oil (ASTM Spec. D396-48T.)

Two of the D9Xs were tested under close factory observance in logging operations in the West and Northwest. AiResearch and Twin Disc engineers worked with Cat engineers during the field tests to design a turbocharger and a torque converter specifically suited for this powerful tractor.

This D9X was tested on bulldozing, scraper work, and push-loading near Birmingham, Ala., on a contract held by Moss-Thorton. Later it worked another 1000 hours in gravel and clay for the DeBardeleben Coal Co.

Florida Diesel News

By Ed Dennis

FROM DIESEL Engine Sales, St. Augustine, for the M. V. *Porpoise III* owned by Marine Studios of Marineland, an Onan model 3MDSP-1R diesel 3 kw generating set; 115 volt, water cooled.

AT LEESBURG cold storage plant, Shelley Tractor & Equipment Co. installed a model 397 rated at 500 hp max. Caterpillar diesel generating set with a 350 kw Electric Machinery generator.

FROM ELLIS DIESEL SALES and Service at Fort Lauderdale, for use in pumping water on construction jobs in the "Glades", two General Motors 6-71 diesels 165 hp mounted on skids for Iry Smith of Jacksonville.

A UD 16 INTERNATIONAL Galion road grader for R. H. Wright Construction Co. at Fort Lauderdale plus a T. D. 18 International tractor from Florida Georgia Tractor Co. at Miami.

ON THE HILLSBORO CANAL, the Gahagan Construction Co. of New York has on their 90 ft barge one GM 6-71 diesel and a D13000 Caterpillar diesel to run two 600 cf Ingersoll-Rand air compressors for use in dynamiting the rock bottom for deepening and widening the canals.

A CUMMINS MODEL JBS 150 hp in a Kenworth COE tractor of the Refrigerated Transport Co., pulling a Thermo King refrigerated trailer.

THE *Inagua Ranger*, a West Indies freighter, was converted and repowered from an ex-Navy LCI at Dade Drydocks with two model D375 Caterpillar diesels. For auxiliary power a model D311 Caterpiller will be used, owned by the West Indies Shipping Company.

RECENT GULF Launchings included the *Sarah-Jo* a 63 ft shrimper with a General Motors 6071-A diesel and the *Lillie Mack* a 73 footer with a Murphy rated at 185 hp with a Twin Disc clutch and power take-off.

THE INTERCOUNTY Construction Co. at Ft. Lauderdale received from Florida Georgia Tractor Co. two Northwest cranes powered with Murphy diesels and a Drott Skid shovel powered with an International diesel.

ENTERPRISE DIESEL engines were selected for repowering the two 110 ft menhaden fishing vessels *Moss Point* and *Ocean Springs*. The 12x15 six cyl. diesels develop 500 hp at 500 rpm. The vessels are owned by Standard Products of Moss Point, Miss.

OVER AT TAMPA the Steamways Corp. launched the 68 ft *Miss Lina* for Arnold Paju, powered with a 190 hp Murphy diesel and Snow Nabsted 3:1 r&r gears. Twin Disc power take-off. It was a package unit by Jacksonville Yacht Storage of Jacksonville.

DIESEL ENGINE Sales at St Augustine launched the *Hesco-One* a 53x16 shrimper powered with a General Motors 6-71 diesel; GM 4.5:1 r&r gears for Hesco Inc. of Charleston, So. Carolina. Also the *Silver Dollar* a 68 footer for Hammond Shrimp Co. of West Palm Beach with a D13000 Caterpiller diesel.

A BUDA DIESEL for the new gill netter, *Jocko II* model DAMR 275 rated 85 hp at 2800 rpm max. with 2:1 Snow Nabstedt r&r gears, sold and installed by J. Frank Knorr Inc.

THE FAIRBANKS-MORSE model 48-AS4 recently installed at pump station S5A is rated at 28 hp at 1400 rpm and is used with a Twin Disc power take-off for the air compressor and pump.

Maximum efficiency, minimum maintenance assured by

TORCON® blade design

A major factor in the uniform high efficiency of Torcon converters is the true Hydra-Foil blade design—a patented feature. The correct combination of blade contour and blade angle assures a smooth flow of maximum power; and eliminates turbulence—a cause of loss of efficiency and wear.

The Clark-Torcon is a complete unit, mass-produced, available off-the-shelf to engine and original equipment manufacturers, and to owners and operators. It's the broadest line, with a wide range of wheel diameters and a complete choice of options, for easy fitting into any torque-transmission system.

There's a Torcon to FIT YOUR NEED

Send for this bulletin.

Well illustrated, easy-to-read, this bulletin will provide a better understanding of torque multiplication and the many industrial power uses to which it is applicable. Use the coupon—no obligation.

Note These Quality Features of the Clark-Torcon Line—

- **True Hydra-Foil Blade** . . . blade contour and blade angle designed for maximum power and high multiplying efficiency
- **No Cavitation** . . . proper oil flow prevents turbulence and the formation of air pockets—a major cause of efficiency loss and wear
- **High efficiency over wide range** . . . produces more work and reduces wear on components
- **Most accessible unit** . . . inspection plates easily accessible; no special tools needed for service
- **Self-contained oil circuit** . . . sump is an integral part of unit. Oil passages cored in housing—no unnecessary fittings, hoses; no leakage, no external oil seals under pressure
- **Individually cast single piece elements** . . . no welds or fabrications to distort under extreme loads
- **A complete line** . . . 15 to 600 H.P.
- **Broad line of options** . . . readily adaptable to a wide range of applications:

Excavator cranes • Oil drilling rigs • Heavy duty trucks and buses • Tractor shovels • Grading machines • Logging equipment • Locomotives

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY, Jackson 2, Michigan: Please send the CLARK-TORCON Bulletin

Name _____ Position _____

Firm _____ Address _____

City _____ Zone _____ State _____

Business Straws In Today's Breeze

THE UNION PACIFIC Railroad has purchased, for delivery this spring and summer, 50 diesel locomotives costing $9,915,000, according to A. E. Stoddard, president. Thirty of the engines will be for passenger service. These 2400-hp units have been ordered from Electro-Motive Division of General Motors Corp. Twenty 1000 hp switch locomotives will be built by American Locomotive Co. The UP also is building 1000 freight cars to cost about $9,038,000.

T. H. BELLING, Fram Corp. president, states that the company's 1954 sales were the highest in history—$23,552,026, an increase of $307,106 over 1953. Net income for 1954 was $929,569 compared to 1953 net income of $877,247, which included a special credit for federal income taxes, depreciation, etc.

THE MISSOURI - KANSAS - TEXAS Railroad has ordered four 1750-hp diesel locomotives from the Electro-Motive Division of GMC. Cost will be $672,000. Bethlehem Steel Co. is delivering 25 all-steel, 70-ton gondola cars to the Katy this spring.

THE WHITE MOTOR CO., Cleveland, with a record of aggressive selling and rapid expansion in the truck manufacturing field, recently bought the engine manufacturing division of National Supply Co., Pittsburgh. Atlas and Superior diesels have been manufactured by National Supply in Springfield, Ohio, and engine sales last year totaled more than $10 million. White plans to move its diesel research department to Springfield and will add a line of high-speed automotive diesels.

CONSOLIDATED DIESEL Electric Corp. has a contract for $10 million worth of Air Force support units. These are used in testing, servicing, and starting jet military aircraft. (See DIESEL PROGRESS, December 1954, pages 30-31.) Consolidated Diesel reports the new contract boosts their backlog of orders to more than $22 million.

MARVIN W. SMITH, president, Baldwin-Lima-Hamilton Corp., recently said: "Our backlog has shown a gradual increase since last August, and if, as expected, this trend continues, prospects are that the second half of 1955 will be much better than for the corresponding period last year. With the recent improvement in the traffic picture of many railroads, prospects are brighter for increasing activity in the coming year. Several foreign negotiations for a substantial number of locomotives are promising and it is expected that these will result in orders in the near future."

THE ARGENTINE government has purchased four new river towboats from Dravo Corp., Pittsburgh. Two are of 2400 hp, with twin diesel engines, and two are rated 580 hp. Dravo helped Argentina make its start in push-towing during 1948-49 by furnishing three towboats, 14 barges, and by training crews to handle them.

A SURVEY among business firms, conducted jointly by the Securities & Exchange Commission and the U.S. Department of Commerce, reveals that 1955 planned plant and equipment expansion will exceed 1954, and that business anticipates 1955 sales will exceed last year's by five percent. The government agencies were told that 27 billion dollars will be spent this year on new plant and equipment. Capital outlays for these purposes were expected to make themselves felt in the April quarter.

NORDBERG MANUFACTURING Co. is building four 12-cylinder 21½x31, 6300-hp engines for delivery in the fall to the Philippine Islands. They will power a 17,600-kw generating plant for

cut your diesel maintenance costs with

PUROLATOR

in these three spots

Even the cleanest fuel supply brings damaging dust, dirt and grit into your diesel engine. Without filtration, injection pumps gall, wear and lose their accuracy. Nozzles get plugged and burn. Even if your engine goes on running, the power output of individual cylinders goes badly out of balance.

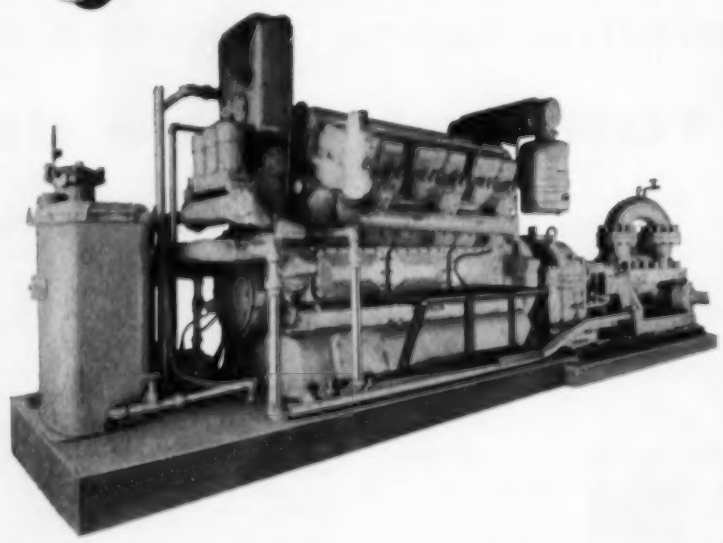
So . . . effective fuel oil filtration is absolutely essential. For your engine to keep running at peak efficiency and with minimum outlay for maintenance, its fuel system should be equipped with PUROLATORS in the three areas listed at the right.

For details of the PUROLATOR models designed for use in these diesel applications, write today for the PUROLATOR diesel catalog. Address Purolator Products, Inc., Rahway, N. J., Dept. DPI-510.

Immediately before and after the transfer pump. The PUROLATOR on the suction side protects the pump. The one on the pressure side takes out any bits of metal worn from the moving pump parts.

In the fuel line before the injection pump. A PUROLATOR here is an inexpensive way to assure smooth, wear-free operation of the injection pump.

Built into each injection nozzle. While there is no obvious source of contamination beyond the injection pump, experience shows that an individual metal-edge filter element built into each nozzle assembly vastly improves nozzle life expectancy.



PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC., Rahway, New Jersey

the U.S. Navy at Subic Bay. This is the first large base load diesel plant the Navy ever purchased, and diesels were specified over steam only after an intensive study of comparative costs and performance. The plant is being erected by a group of three well-known American contracting firms, — Pomeroy-Hawaiian Dredging-Bechtel.

HERBERT G. WEST, Inland Empire Waterways Association vice-president, sees "a new era in river transportation" with the introduction this spring of larger barges on the Columbia River. Whereas barges of 500-to-1100 tons have been in use, the first of two 4600-ton-capacity barges went into service recently. After completion of the John Day dam, fully loaded ocean-going barges can be towed up the Columbia to Walla Walla, Kennewick, and Pasco, Mr. West states, adding "10,000-ton cargo hauls on the Columbia River are almost here."

TRANSCONTINENTAL GAS Pipe Line Corp. continues to advance plans for its $83 million 1955 construction program. It has registered 150,000 shares of cumulative preferred stock. Proceeds from this sale of $15 million plus a $60 million bank credit will be used to extend the system now stretching 1842 miles from the Texas-Louisiana gulf coast to the New York metropolitan area.

Tractor at Cleveland Coal Show

Euclid's new TC-12 Twin Power crawler tractor will have its first public showing at the American Mining Congress Coal Exposition in Cleveland, Ohio May 16-19th. The TC-12, asserted to be the most powerful tractor in production, is a new concept in crawler design and operation. (See DIESEL PROGRESS, November 1954.) Powered by two GM diesel engines of 194 hp each, the tractor incorporates the twin power principle pioneered by Euclid. It has two Allison Torqmatic Drives which permit independent control and drive of each track.

There is no clutch or manual shifting of transmission gears. The operator simply moves a lever to select the proper speed range for the job being done. Three speeds forward and reverse to 8.3 mph.

In addition to the TC-12 tractor, Euclid's new Model S-7 overhung engine 7 yd. scraper will be on display for the first time at the Coal Show.

Bulletin

A new 6-page bulletin descriptive of Fageol-Leyland diesel engines is announced by Twin Coach Company, Kent, Ohio. Complete mechanical specifications, horsepower and torque curves and dimensional drawings are bulletin features. Horizontal and vertical models of both the 600 and 680 cubic inch Fageol-Leylands are described in detail.

These engines, according to the manufacturer, are now being widely employed as replacements for worn gasoline engines in old large-capacity buses. In such applications they are reported to effect fuel and maintenance savings up to 4 cents per mile. Other Fageol-Leyland uses include marine, motor truck, and industrial stationary applications. For bulletin copies, write to Twin Coach Company, Kent, Ohio. Ask for Bulletin L-6841.

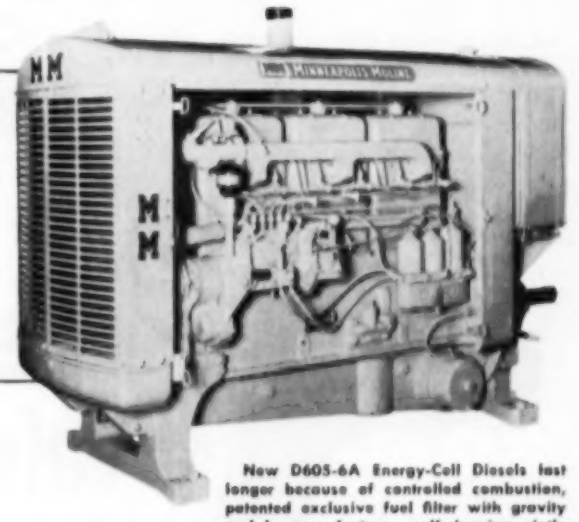
Places Order for Locomotive

Rockland Light & Power Company, Tomkins Cove, N. Y., has placed an order with Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., for a 25 ton diesel hydraulic industrial locomotive. Equipped with a 225 horsepower Cummins diesel engine, the locomotive will develop a tractive effort of 12,500 pounds at 25 per cent adhesion. Rockland Light will use the new locomotive for coal and ash handling service at its Lovett Plant.

WHY IT PAYS TO OWN INDUSTRIAL DIESELS WITH REMOVABLE CYLINDER BLOCKS AND HEADS

New MM diesels were developed with *energy-cells* to make them last longer, do more and go farther with less down-time and maintenance.

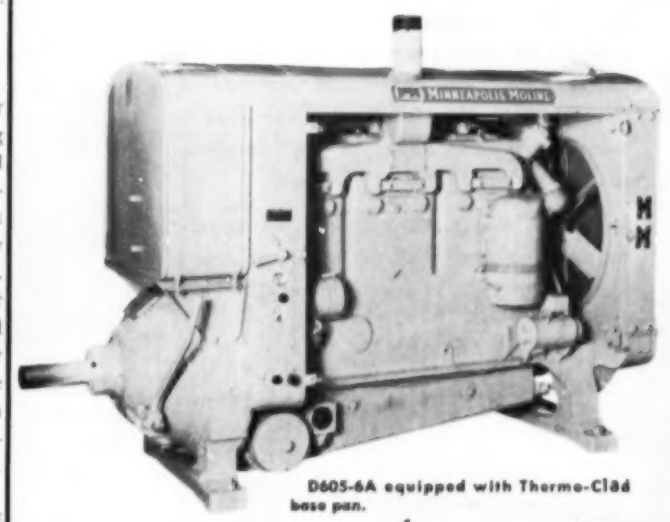
To provide owners with lower cost maintenance when necessary MM diesels are the most advanced and soundly engineered because the cylinder blocks are cast in pairs separate from the crankcase.



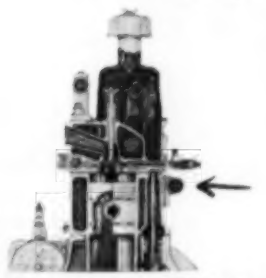
New D605-6A Energy-Cell Diesels last longer because of controlled combustion, patented exclusive fuel filter with gravity and by-pass features, self-cleaning pintle type nozzle, directed cooling of area around combustion chambers.

YOU GET THESE ADDED ADVANTAGES . . .

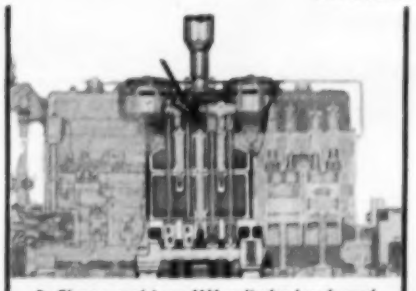
1. Ease of maintenance and low cost emergency service because paired cylinder blocks, pistons, and rods can be removed as a unit by one man.
2. Prolonged time between overhauls by use of close-grain cast iron that provides best cylinder lubrication for reduced wear.
3. Less service due to minimum distortion as MM cylinder heads, cylinder blocks and crankcase are virtually strapped together by full-length steel studs anchored in the main bearing bulkheads. (Transmits combustion pressure to heavy crankcase that has extra depth below center line of crankshaft.)
4. Efficient operation obtained by uniform cylinder expansion . . . the result of controlled cooling and long oil-cooled cylinder wall skirts below ring travel area.
5. "New engine" performance at extremely nominal cost can be obtained right in the field without special tools using factory matched cylinder blocks, pistons, pins, and rings. (Blocks are dowelled to crankcase to assure bore is square with crankshaft and pistons are precision fit to bore . . . equivalent to a factory job.)
6. Lower initial cost stems from high production parts by casting cylinder blocks in pairs separate from the crankcase.



D605-6A equipped with Thermo-Clad base pan.



1. Cylinder head and block assembly shows coolant entrance at hottest point first and extra long skirt wall construction.



2. Close-up of how MM cylinder heads and blocks and crankcase are tied into a single rigid unit with long studs.

3. A D283 feature is extra large oil filter enclosed in base pan, floating-screen oil pump intake, and pump located in bottom of base pan.

Optional Thermo-clad water-blanketed base pans for all units also have oil filter included to give more effective filtering.

INDUSTRIAL MM MINNEAPOLIS-MOLINE MODERN MACHINERY DIVISION

MINNEAPOLIS-MOLINE

MINNEAPOLIS 1, MINNESOTA

European Diesel News

By Hamish Ferguson

ENGLISH ELECTRIC DIESEL LOCOMOTIVES Included among the considerable number of diesel-electric locomotives, shunters, and railcars built by the English Electric Co. Ltd. are the following:— BRITISH RAILWAYS. Over 900 — 660 volt dc motor-coach equipments. Some 450 — 350/400 hp diesel-electric shunting locomotive equipments.

NETHERLANDS RAILWAYS 100 — 400 hp diesel-electric shunting locomotives.
RHODESIA RAILWAYS 23 — 2,000 hp main-line diesel-electric locomotives.

SOUTH AFRICAN RAILWAYS 60 — 2,000 hp 3,000 volt dc electric-locomotives.

SPANISH NATIONAL RAILWAYS 60 — 2,000 hp 3,000 volt dc main-line electric locomotives.

The Spanish locomotives are the most powerful of their type yet built in Great Britain, and the Rhodesian locomotives the most powerful diesel-electric ever built for a narrow gauge railway.

OIL DISCOVERY IN CENTRAL ENGLAND. Exploration is continuously being carried out in England to discover sources of useable oil, and a number of small deposits have been found from time to time. The latest of these is at Plungar, Leicestershire, where the British Petroleum Company have drilled a well to a depth of 2,840 feet. The yield is reported to be about five tons per day.

S. S. *SOUTHERN CROSS*. This new passenger liner, built by Harland & Wolff, Belfast, for Shaw Savill & Albion Co. Ltd., has now been completed. Though the main propulsion machinery consists of twin 20,000 shp steam turbines, the auxiliary machinery is electrically driven from power supplied by six diesel generating sets supplied by Mirrlees, Bickerton & Day Ltd. of Stockport. The engines are of the K8 type, each being coupled to a 600 kw generator at 220 volts dc

DIESEL LOCOMOTIVES IN CEYLON. Ceylon Government Railways ordered, in 1953, 25 main-line diesel-electric locomotives for their home system, and a number of these are now in service. They were supplied by Brush Bagnall Traction Ltd. who are members of Associated British Oil Engines Ltd. The mechanical parts are manufactured by W. G. Bagnall Ltd., the electrical equipment by the Brush Electrical Engineering Co. Ltd., and the engines by Mirrlees, Bickerton & Day Ltd. of Stockport. Each locomotive weighs 87 tons and the power provided by the single diesel is 1,000 bhp. The maximum speed is limited to 55 mph to suit track limitations and the steepest gradients to be negotiated are of the order of 40 to 1.

BRISTOL OLYMPUS TURBO-JET. The Bristol Olympus 101 turbo-jet engine has been officially approved for service at 11,000 lb. thrust without after-burning. This approval has been granted by the Ministry of Supply following the engine's successful completion of the 150-hours type test, and the Olympus is thus established as the most powerful type-tested engine in the world.

MEADOWS GEARBOX DIVISION. Henry Meadows Ltd. of Wolverhampton, manufacturers of marine, automotive, and industrial engines, have formed a gearbox division to handle the production and sales of the gearboxes required for their standard products. The Gearbox Division can offer a range to suit vehicles between 30 cwt and 12 tons capacity, in addition to those for industrial and marine applications. Henry Meadows Ltd. is an Associated British Engineering Company.

FIAT DIESELS IN ARGENTINA. The Argentina Railways are now using Fiat four-stroke diesels for railway traction purposes, and it is now announced that the Fiat Company will establish and operate

EATON
Valves and Bolts
FOR DIESEL ENGINES

Eaton Diesel engine parts combine the experience of many years as suppliers to the Diesel engine industry with the most modern precision production facilities—plus a thorough understanding of the problems peculiar to the Diesel engine field.

Eaton engineers will welcome the opportunity to discuss the application of Eaton Valves and Bolts to your engines.

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General Offices: CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves . Tappets . Hydraulic Valve Lifters . Valve Seat Inserts . Jet Engine Parts . Rotor Pumps . Motor Truck Axles . Permanent Mold Gray Iron Castings . Heater Defroster Units . Snap Rings Springtites . Spring Washers . Cold Drawn Steel . Stampings . Leaf and Coil Springs . Dynamatic Drives, Brakes, Dynamometers

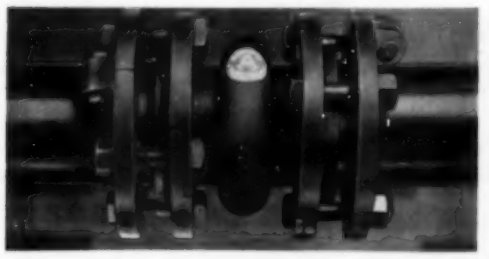
a new factory in that country to build the engines required for their own internal system.

B. U. T. RAILCARS. The photograph shows a typical railcar of the type now in use on some of the branch lines of British Railways. It is manufactured by British United Traction Ltd., Leyland, Lancs., and is an 8-wheeled bogie type having two

vertical diesel engines driving the axles through an air-operated epicyclic gearbox. Electro-pneumatic controls are employed in such a way that a number of power cars may be coupled together, with or without intermediate coaches, and controlled from a single driver's cab.

Rubber Expansion Joints

Rubber Expansion Joints specially designed for use with piping and flanges made by Haveg Corporation and The Duriron Company, Inc. have been announced by The Garlock Packing Company. These expansion joints are made of a high-grade rubber compound combined with plies of sturdy cotton duck and reinforced with steel wire. Steel rings are incorporated in the flange ends of the joint to permit tightening of the connections without shearing the expansion joint.



The company can supply these special expansion joints for various services as follows: with neoprene lining if some oil is present in the line; with neoprane cover and neoprane lining if, in addition, the outside of the joint is in contact with oil; neoprene throughout if the line carries petroleum derivatives; with Teflon liner if the line carries liquids or gases harmful to rubbers.

Known as Garlock 209 Expansion Joints, they are furnished for pipe sizes from 1-in. to 12-in. inclusive. Complete infirmation is contained in Folder AD-137. Copies may be obtained by writing The Garlock Packing Company, Palmyra, N. Y.

Traveling Classroom

As an aftermath to the diesel-electric revolution in railroads, the itinerate school master is again making an appearance on the American scene. Five or six times a year, depending on the railroad demand, the General Electric Company sends out from its central maintenance school in Erie, Pa. a traveling "teacher" to aid roads requesting instruction on operating and maintaining G-E diesel-electric locomotives. Actual class room sessions are set up on railroad property and everyone, particularly shop men, who has anything to do with locomotives is invited to attend. "Texts" consist of instruction books explaining the hows and whys of operating, maintaining, and overhauling equipment. A locomotive school semester, on the average, is one week.

G.E.'s traveling school is an extension of its regular maintenance course held several times a year at the company's Locomotive and Car Equipment Department in Erie. Subject and frequency of these schools are determined by demand.

Last year, "students" came from Indonesian State Railways, Chilean State Railways, Argentina State Railways, and General Electric overseas affiliates.

New

United Rectangular Diesel Air Cleaner Helps International Crawlers Breathe Easy

This new United Specialties rectangular diesel oil bath air cleaner, installed on International TD-24, TD-18A and TD-14A crawler tractors, provides major improvements in air cleaner design and operation.

1. Meets Limited Space Requirements

Rectangular shape of air cleaner conforms better to engine shape — fits snugly under hood — makes most efficient use of available space.

2. Lower Installation Cost

Air cleaner outlet can be taken at any point around the perimeter of the clean air chamber, providing the shortest connection to manifold.

3. More Air Volume

The rectangular cleaner, with sides of the same length as the diameter of a circular cleaner, contains far more surface area. This helps slow down air velocity through cleaner, safeguards against oil carryover from cleaner to engine.

4. Simple Maintenance

Removable scrubber element can be easily detached for cleaning.

For the newest and finest in oil bath air cleaner protection, call on United Specialties. Our experienced sales engineers can help you with your air cleaner design problems. We invite your inquiry.

UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION — CHICAGO 28, ILL.
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FRAM Water Separator & Fuel Filter ends corrosion, rusting, pitting with 100% water removal

Here's how FRAM's *double-action* Water Separator & Fuel Filter gives your fuel injectors complete protection:

1. **100% WATER REMOVAL** Removes all water before injection . . . saves costly injectors from corrosion, rusting and pitting!
2. **TRAPS DIRT AND DUST** FRAM Filtration traps and removes dangerous dirt before it reaches injectors . . . ends abrasive action!

Save on injector replacements . . . cut down-time! Write for information on FRAM Water Separator & Fuel Filter today!

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Inland River Reports

By A. D. Burroughs

WE WATCHED a busy eight hours at Lock 2, Monongahela River with many of the active diesel towboats going through. Three of Jones & Laughlin Steel's were there—the *Shannopin*, built by Dravo in 1951 and powered by Superior 8 cyl. diesels for a total 1066 hp was first. Following her was *Aliquippa*, also powered by Superior diesels with a total of 1400 hp at 800 rpm. A sister boat, *Titan*, a duplicate of *Aliquippa*, followed within an hour or so.

ON THE OHIO, near Greenville, Capt. Jim Bruno was doing a neat job piloting the powerful *Claude Tully*, owned by Patton-Tully Transportation Co. Upward bound, he was getting good power from her Fairbanks-Morse 10 cyl. Model 38 diesels rated 3200 hp at 720 rpm.

CAPT. EMORY TUCKER succeeded in getting the Union Barge Line's *Peace* past Gallipolis before these locks were out of commission due to high flood stages and made a fast run to New Orleans. Powered by GM 12 cyl. diesels with 1500 hp at 700 rpm which were put in in 1948, this boat has been in active service for many years. Inland river folks can remember when the *Peace* was new and made that memorable trip of goodwill from Pittsburgh to New Orleans towing an exhibit barge, stopping at the larger towns en route.

ANOTHER OLD FAITHFUL, the Dravo towboat, *Pioneer*, was downward bound powered by her Caterpillar D-397 diesel installed in 1952. She ran her trial trip on May 13, 1937 being the first river boat equipped with Kort nozzle.

FOLLOWING the *Pioneer*, the *A. V. Criss, Jr.*, was upward bound with six empties. Powered by Superior diesel engines with a total 1020 hp, she won acclaim by taking an initial gas tow to Omaha, Nebraska, in 1939.

MISSISSIPPI VALLEY Barge Line's *Central* has been active in the Cairo-St. Louis trade with more barges for the lower river. Built in 1950 by Calumet Ship she measures 140x35x10, getting good speed from her Enterprise 8 cyl., 16x20 diesel engines totaling 3000 hp at 290 rpm.

THE *Esso Tennessee*, owned by Esso Standard Oil Co., was northward bound passing Greenville pushing a 10 barge tow more than 1,000 feet long. Engineers Odessa Turnipseed and C. E. Camus were in charge of her Superior diesel engines, supercharged, with a total of 2000 hp.

ENGINEERS Charles Doyle and J. A. Pardue report enthusiastically about their work with the Enterprise turbocharged 8 cyl. 16x20 diesel, with 1700 hp at 360 rpm on the *Reba-Jane*. Originally named *Robin-E*, she was the first river towboat built at Port Arthur, Texas by Gulfport Shipbuilding and Dry Dock Corp. Now owned by Thomas Petroleum Transit Co., she was upward bound piloted by Capts. E. D. Young and Stu Wilcox.

OUR APPRECIATION to Mrs. Emma Schulz for this report: "We saw the *Jimmy Cole* which is active here on the Kanawha River leaving Belle, W. Va., with a tow from the Du Pont dock. A mighty pretty boat." *Jimmy Cole* is equipped with Worthington 8 cyl. 14½ x18 diesels with total 1500 hp at 350 rpm.

ON THE Upper Mississippi, we saw one of the leaders in this year's commercial parade, *Stanolind A.* returning south. Powered by Busch-Sulzer diesels with a total 1200 hp, she is owned by Standard Oil Co. (Ind.).

THE *Illini*, another busy boat on the Mississippi, was returning from Albany with several empties. She is powered by Cooper-Bessemer JS-6 diesels with 2200 hp at 400 rpm. Westinghouse pilothouse controls are on all three engines.

THE VETERAN *Laguna* was back in active service on the upper Mississippi with relief chief Jack Chapman handling GM 12 cyl. diesels totaling 1800 hp.

AMERICAN BARGE Line's *Advance*, active between Gallipolis and Pittsburgh, was seen passing Clarington with a tow of nine steel, one oil, and one sulphate. Originally an LSM 375, she is entirely remodeled into an efficient river towboat getting good power from her Fairbanks-Morse 10 cyl. 8x10 diesels with a total 2880 hp at 720 rpm. Capt. Phil Brown took command of this boat at Point Pleasant relieving Capt. Wright.

CAPT. BROWN, before taking command of *Advance*, had been in charge of the *Jefferson*. Capt. Harold Birchfield relieved Capt. Brown and reported getting good speed from her Cooper-Bessemer LS-8 engines rated at 2000 hp at 300 rpm.

CAPTS. JOHN HONEYMAN and Van Powell reported little trouble in taking the *Arnold V. Walker* (owned by A. L. Mechling Barge Lines) upward against a fast current. She is powered with 1800 hp from her General Motors diesels.

PETCO 20, 1800 hp General Motors diesels, owned by Petco Corporation, is to be renamed *Clark St. Paul*.

Nuclear-Powered Locomotive

The Atomic Energy Commission announced recently that an agreement has been signed by the Commission and by the Baldwin-Lima-Hamilton Corporation of Philadelphia, Pennsylvania and the Denver and Rio Grande Railroad of Denver, Colorado for a study of a nuclear powered reciprocating engine under the AEC's Industrial Participation Program. The companies will weigh the engineering, technical and economical aspects of a nuclear-powered engine of this type and make recommendations concerning the role industry might undertake in carrying out the development. There are many potential applications of a power generating unit of the type under study, including locomotive propulsion.

Variety in Production

A greater variety of locomotives was built by the General Electric Company in 1954 than in any previous year, according to Guy W. Wilson, general manager of the Company's Locomotive and Car Equipment Department in Erie, Pa. In all, 40 different types of diesel-electric, gas turbine electric, and straight electric locomotives were built for both underground applications as well as for surface work.

Among the most unique were rectifier electric locomotives which convert commercial ac power to dc through electronic tubes; special "weatherized" locomotives for Alaska that operate in temperatures as low as −65°f; the largest underground electric locomotive; the largest underground diesel-electric locomotive; and locomotives for a steel mill for operation on 23-inch wide track.

During 1954, according to Mr. Wilson, GE also shipped 38 locomotives to Uruguay to complete the diesel-electrification of that country. Other sizeable foreign orders completed during the year were thirty 105-ton locomotives for Argentina; twelve 115-ton locomotives and thirty 70-ton locomotives for Chile; five 110-ton locomotives for Santa Catarina, Brazil; and ten 76-ton locomotives for Pakistan. In addition, 15 more gas-turbine electric locomotives were built to bring the total in active service to 25, Mr. Wilson said.

Manufacture began in 1954 on ten 68-foot, 174-ton rectifier-type electric locomotives which can convert commercial ac power to dc. The locomotives are equipped with the same mass-produced dc motors that are used on regular diesel-electric locomotives. They can operate from two power sources: 600-volt dc third rail and an 11,000-volt overhead trolley. Two 83-ton locomotives for operation between Skagway, Alaska, and Whitehorse, Canada must climb from sea level to 2885 feet in 20 miles and operate in temperatures that range from −65°f in the winter to 80°f in the summer time.

Among the many special designs for diesel-electric locomotives were two 45-ton, 23-inch-gauge locomotives for a steel company. It marked the first time so much weight and equipment was crowded into such a limited space—five feet, eight inches wide, eight feet five inches high, and 18 feet long, according to Mr. Wilson. In the underground field, Mr. Wilson said that the largest mining locomotive for underground service was shipped. It was a 600-horsepower, 50-ton unit which was 35 feet long and 48 inches high. A diesel-electric locomotive, which is 47 feet seven inches long and six feet high was built for high-speed, underground operation. Its top speed is 30 mph.

Compressor Catalog

A new 12-page catalog just issued by Le Roi Division of Westinghouse Air Brake Company pictures all of the 40 models of portable type compressors available. The quick reference chart easily shows the contractor the capacities, engine types, and mountings available. The colorful bulletin also illustrates the exclusive Air-master features such as: Replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Short easy reading captions can provide a quick explanation for the reader in less than two minutes. Copies of this new piece of literature, CG-9A, can be obtained by writing to: Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Company, 1706 South 68 Street, Milwaukee 14, Wisconsin.

Transferred To Chicago

Wayne E. Greene, formerly International motor truck district sales manager at New Orleans, has been transferred to Chicago in the same capacity, it was announced by R. M. Buzard, manager of sales, motor truck division, International Harvester Company. He replaces M. F. McCarty who has been Harvester's Chicago motor truck district manager for the past 23 years. In anticipation of his retirement, Mr. McCarty will serve as supervisor of national and fleet sales in the Chicago area.

Mr. Greene, a 21-year Harvester sales veteran, began his company career as a salesman at the company's Sweetwater, Tex., district office. He served there both as a farm equipment and motor truck salesman. In 1937 he was made manager of Harvester's motor truck retail branch at El Paso, Tex., and two years later was appointed assistant motor truck district manager at Tulsa. Mr. Greene later served in the same capacity at Houston and Dallas. In 1942, Greene enlisted in the U. S. Army and in 1943 became Chief of the Tank Section, Office of Chief of Ordnance, Detroit. He was discharged in February 1946 with the rank of major.

Following Army service, Greene rejoined the Harvester organization as assistant motor truck district manager at New Orleans. He became motor truck district manager there in 1946 and served up to the time of his new appointment.

Technical Paper Available

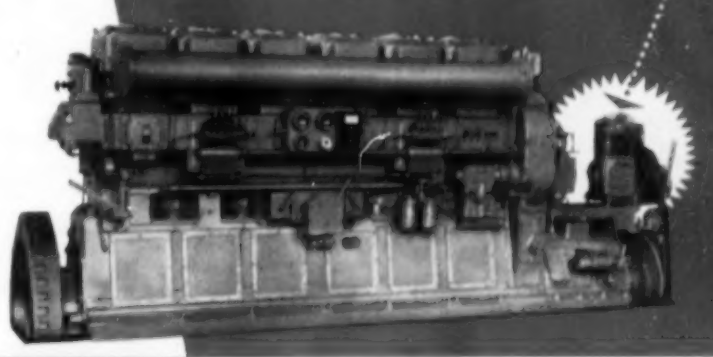
"Cooling Tower Wood Can Be Protected" is the subject of Technical Paper No. 130, prepared by W. H. & L. D. Betz, Philadelphia 24, Penna. In recent years deterioration of cooling tower wood has been recognized as a problem of increasing importance in industry. This paper discusses how chemical and bacteriological attack can be controlled by acid treatment and wood preservatives to kill fungi.

Copies of Technical Paper No. 130 may be obtained by writing W. H. & L. D. Betz, Gillingham & Worth Streets, Philadelphia 24, Penna., or File 121, DIESEL PROGRESS, Cole Station, Los Angeles 46, Calif.

Purchases Diesel Generator Units

The installation of two new diesel generators at the Municipal Electric Generating Plant, Franklin, Louisiana, will add 2800 kw to the plant capacity in the spring of 1955. The two 360 rpm engines will be built by the Worthington Corporation, and the two 1750 kva, 2400 volt generators by Electric Machinery Mfg. Company.

COOPER-BESSEMER CHOOSES Quincy COMPRESSORS FOR STARTING AIR



Quincy Compressors are standard equipment on Type JS-6 Cooper-Bessemer Diesel Engines. Cooper-Bessemer — like other leading engine manufacturers — have found that Quincy Compressors give them the long dependable service they require.

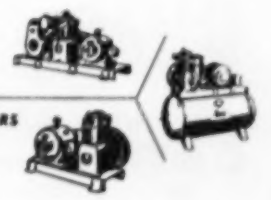
Rely on the experience and judgment of these engine makers, specify a Quincy Compressor for your next diesel starting job.

There's a model for every application. Sizes run from 1 to 90 c.f.m.

Write Dept. K-43 for our recommendations on the proper unit for your job.

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS

MAKERS OF THE WORLD'S FINEST AIR COMPRESSORS



Mid-Continent Diesel News

By Jack F. Cozier

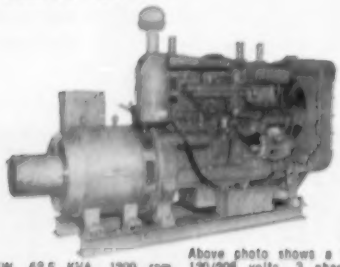
THE CITY OF LINDSAY, Okla., is installing in their municipal light plant one Nordberg Supairthermal FSE-138-HSC spark ignited natural gas engine. The 1130 kw unit will be in operation by mid-summer.

KATO

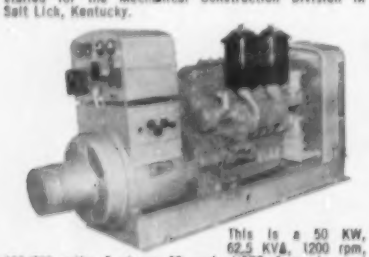
Continuous A.C. Standby Power

GENERATORS

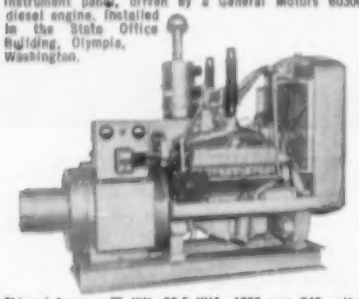
. . . a size and type to meet your needs to 400 kw



Above photo shows a 50 KW, 62.5 KVA, 1200 rpm. 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an International Model UD-18A diesel engine. Installed for the Mechanical Construction Division in Salt Lick, Kentucky.



This is a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by a General Motors 6030C diesel engine. Installed in the State Office Building, Olympia, Washington.



This pictures a 75 KW, 93.5 KVA, 1800 rpm, 240 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an H-540 LeRoi engine utilizing natural gas for fuel. For Republic Steel Corporation of Gary, Ind.

An illustration of KATO's versatility: A 350 watt KATO Generator driven by a Lauson LMH engine and a 150 KW, 187.5 KVA, 750 rpm, 120/208 volts, 3 phase, 25 cycle KATO Generator and instrument panel—driven by a General Motors twin 6-71 diesel engine. For Duluth, Mesabi & Iron Range Railway.

Your Inquiries Invited.

Builders of Fine Electrical Machinery Since 1928

KATO Engineering Company

1443 First Avenue, Mankato, Minnesota

KRAUS PLOW CORP., Hutchison, Kansas, has purchased a Buda 6DA-273 diesel engine to power a forage harvester, from Buda Engine & Equipment Co., Tulsa, Oklahoma.

MILLER & MILLER Freight Lines, Wichita Falls, Texas, has purchased a number of RP-205 International Harvester tractors. The units sold by International Harvester Co., Dallas, Texas, are powered by IH RD-450 butane-propane engines.

CITY OF PONCA CITY, Oklahoma, municipal light plant has purchased a Nordberg TSGL-2910 dual-fuel engine. This 6000 kw unit develops 8500 hp with a 29 in. bore and 40 in. stroke. The 10 cylinder engine is the largest dual-fuel engine in the United States and will be in operation in late Summer.

FRANK WHEATLEY Pump & Valve Manufacturer, Tulsa, Oklahoma, has purchased a Buda 8TCS-2505 natural gas engine to power a Quintuplex pump. The unit to be delivered to a pipeline company in Southern Kansas was sold by Buda Engine & Equipment Co., Tulsa, Oklahoma.

J. L. PUTMAN oil field contractor, Ada, Oklahoma, has purchased a Caterpillar D6 tractor with a Cat #46 hydraulic control and a 6S dozer. The unit sold by McCormick Machinery Co., Tulsa, Oklahoma, has a Hyster D6N winch on the unit.

IRVY CONSTRUCTION CO., Shreveport, La., has purchased a model 240 Cleveland trencher powered by an IH UD-14 diesel engine. The trencher was sold by Leland Equipment Co., Tulsa, Oklahoma, and will be used in pipe line contracting work.

THOMAS M. BERRY CO., Stillwater, Okla., purchased a Cat D6 tractor with a 6S dozer and a #46 hydraulic control. The unit will be used for general contract work and was sold by McCormick Machinery Co., Tulsa, Okla.

GABBERT & JONES Drilling Co., Wichita, Kans., just purchased two 8MO-1290 Buda gas engines and they will be delivered by a major supply company. The engines were sold to the supply company by Buda Engine & Equipment Co., Tulsa, Okla.

H. G. COZAD Construction Co., Sulphur, Okla., has just bought a Cat D8 tractor with a #25 cable control and an 8A dozer. The tractor was sold by McCormick Machinery Co., Tulsa, Okla., to this AGC highway contractor.

CITY OF COMMERCE, Texas, municipal light plant is installing a Nordberg Supairthermal FSG-138-HSC dual-fuel engine. This 1300 kw unit develops 1830 hp and will be in operation in late Summer.

NALL BROTHERS oil field contractors, Seminole, Okla., have just purchased a Cat D6 tractor with a #46 hydraulic control and an 6S dozer. The unit was sold by McCormick Machinery Co., Tulsa, Okla.

KNIGHT MFG. & SUPPLY CO., Tulsa, Okla., has bought three model 6MO-970 Buda gas engines from Buda Engine & Equipment Co., Tulsa, Okla. The units will be used to power gas compressors.

O. E. CARPENTER general contractor, Bixby, Okla., just bought a Cat D6 tractor. The unit purchased from McCormick Machinery Co., Tulsa, Okla., will have on it a 6S dozer and will be used for custom construction work.

A. C. HOLDER Construction Co., Tulsa, Okla., purchased a 140 Cleveland trencher powered by an IH UD-9 diesel engine. The unit will be used for pipe line work and was bought from Leland Equipment Co., Tulsa, Okla.

GEORGE R. COHEA, Tulsa, Okla., has bought a Cat D4 tractor with a #44 hydraulic control, a 4S dozer and a #40 scraper. The tractor was purchased from McCormick Machinery Co., Tulsa, Okla., and will be used for custom finishing work on a housing development.

PRODUCERS Chemical Co., Borger, Tex., purchased a GM 2-71 diesel engine to power a centrifugal pump from Diesel Power Co., Tulsa, Okla.

S. R. SMITH Construction Co., Tulsa, Okla., has just purchased a Unit 1020-A back hoe powered by a GM 4-71 diesel engine. The unit, sold by Midwestern Engine & Equipment Co., Tulsa, Okla., will be used on the municipal water line in Tulsa.

SERVICE Pipe Line Co., Tulsa, Okla., purchased two Alco 251-B dual fuel engines for their Layton, Kans., station. The two engines develop 2083 hp apiece on Bingham centrifugal pumps through Falk gears.

GREAT LAKES Pipe Line Co., Kansas City, Mo., has purchased five additional Alco 12½x13 turbocharged engines. These new units supplement approximately 70 now in operation.

BELL ENGINE Service, Great Bend, Kans., just purchased three Buda 8MO-1290 gas engines for irrigation work in western Kansas.

TORSON Construction Co., Kansas City, Mo., purchased a model 6 Northwest pullshovel powered by a model 20 Murphy diesel from Funkhouser Machinery Co., Kansas City, Mo.

J. W. BATESON Co., Dallas, Tex., has purchased a model 20 Murphy diesel powering a Northwest model 6 pullshovel to be used for expansion work at Tinker Field, Oklahoma City, Okla.

★ for DIESEL LUBE & FUEL OILS

NEW Honan-Crane **Full Flow Filters**

give you **EXTRA HIGH flow rates— 25 to 900 GPM!**

plus *these time and money saving features*

Greater Filtering Efficiency
Designed for in-line installation. Every drop of oil in the system gets continuous filtration . . . solid particles down to micronic size (1 micron: 0.00004") are removed.

Large Dirt Holding Capacity
Uses remarkable new "Flo-Pac" Cartridge—a product of two years' research. Cartridge contains 44 square feet of filtering surface . . . has exceptionally long life.

Rugged Construction—Built of heavy gage, formed steel for heavy-duty service with a minimum of upkeep. No moving parts. Special cover and cartridge gasket seals eliminate leakage and bypassing of oil.

Sizes to Meet All Flow Requirements—The Honan-Crane Full Flow Filter is available in nine compact models using one to 36 "Flo-Pac" Cartridges. Flow rates range from 25 to 900 GPM to provide "custom" filtration in any application, large or small. Completely inert cartridge will not remove additives or inhibitors.

QUICK OPENING COVERS

Covers are fastened by swing bolts which can be loosened in seconds. Larger models have unique lifting device that raises and swings cover to one side for easy access to cartridges.

Write for 8-page Equipment Bulletin 101 giving full details.

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HOUDAILLE-HERSHEY OF INDIANA, INC.
FILTRATION DIVISION

a subsidiary of HOUDAILLE-HERSHEY CORP.

Air Force Orders 726 Diesel Generating Units

Successful bidder on an order for 726, 10 kw diesel generator units to be used by the United States Air Force virtually anywhere in the world is the John R. Hollingsworth Corporation. The contract, in addition to covering manufacture, testing, etc. includes complete design of the units to meet many special conditions. As this is being written early in the year, the design stage has been completed and pilot model units were expected to be ready for test by the middle of February.

A number of special conditions imposed by the Air Force have brought together in these units many interesting, if not exactly unique features. First the units are mounted on two-wheel trailers and since the entire assembly—engine, generator and trailer are to be transported by air they are subject to severe space and weight limitations. Use of aluminum for some of the engine parts, such as manifolds, has enabled the builder to keep the overall weight within 3600 pounds. The units will power mobile communications and navigational facilities.

Prime movers are Hercules Model DIX-4D diesel engines—3⅝ in. bore, 4 in. stroke, 166 cu. in., 4-cycle, rated at 1800 rpm. to develop full required output anywhere from sea level to 6000 ft. altitude, and in ambients from minus 65 degrees F. to plus 125 degrees F. Specifications require that the engines must operate satisfactorily on Military Fuel Spec. No. MIL-F-896 or Jet Fuel, grade JP4, Spec. No. MIL-F-5624 or Kerosene Spec. No. VV-K-211.

The engines are fitted with Roosa-Master fuel injection pumps. Since it is required that frequency be held to plus or minus ⅓ of 1% at any load within the prescribed range, the governor built into the Roosa pump has been modified to meet this condition, also to provide an overspeed stop. Low lube oil pressure and/or high cooling water temperature controls actuate governor engine stop.

Winterization of the engine received special attention because of the extremely low minimum ambient specified. For starting at—65°F. a Perfection Stove heater is attached to the engine. It is arranged to heat and circulate the engine coolant. The exhaust gases from the stove are used to heat the lube oil, injection pump and intake manifold. An air to air heat exchanger consisting of a jacket around the exhaust manifold of the stove supplies clean, warm air which is used to hold the two 24 volt storage batteries at efficient operating temperature. The engine starting system is Delco Remy electric.

An ingenious and fool proof fuel replenishment system has been worked out for these units. Built into the Roosa injection pump is a fuel transfer pump. There is another fuel transfer pump provided which operates continuously while the engine is in operation. This pump is fitted with a flexible hose to bring fuel from a reserve tank and the insertion of the hose in the reserve tank outlet automatically opens the outlet valve. This eliminates the chance of failure to open the valve and thus draw on the reserve supply. Excess fuel above the capacity of the day tank is returned to the reserve tanks. Generators are 10 kw, 80% pf., 60 cycle, 120 volt, single phase, 2 wire or 120-240 volt single phase, 3 wire. They are single bearing machines, the frame being secured directly to the engine bell housing by means of a special disc-type flexible coupling. The unit is equipped with magnetic amplifier-type voltage regulators required to meet rigid requirements for voltage regulation.

These special trailer mounted units as manufactured by Hollingsworth have to pass the rigid Munson road test.

• • • regulate the 12 cylinder 1200 H.P.
main propulsion Diesel engine
on the CHARLIE S.
built and operated by Davie Shipbuilding;
Ltd., of Lauzon, Levis, Quebec, Canada

The Marquette
METAL PRODUCTS CO.
CLEVELAND 10, OHIO
SUBSIDIARY OF CURTISS-WRIGHT CORPORATION

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ROLLER BEARING TEXTILE SPINDLES
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FUEL OIL PUMPS AND INJECTORS
SPRING CLUTCHES
ROTARY HIGH PRESSURE OIL FIELD PUMPING MACHINERY

To Present Paper at International Conference

William J. Fritton

William J. Fritton, vice president and director of the Van der Horst Corporation, Olean, New York, will present a paper on maintenance techniques employed on diesel-electric locomotives at the International Internal Combustion Engines Congress, scheduled for The Hague, The Netherlands, in May. More than 500 combustion engine specialists from Norway, Sweden, Denmark, the United Kingdom, Switzerland, Belgium, Gemany, France, Italy, Spain, Japan, the United States and the Netherlands will take part in the five-day meeting starting May 23.

Mr. Fritton's paper, "Maintenance Techniques Employed in Diesel-Electric Locomotive Repair Shops of United States Railroads", is based on years of practical working experience with railroads as a sales and service representative of the Van der Horst organization.

Another American, C. Fayette Taylor, professor of automotive engineering at Massachusetts Institute of Technology, also will present a paper at the Congress. Professor Taylor's subject will be the relation of cylinder size on the design and performance of diesel engines in railway and marine service applications.

All Aluminum Boat

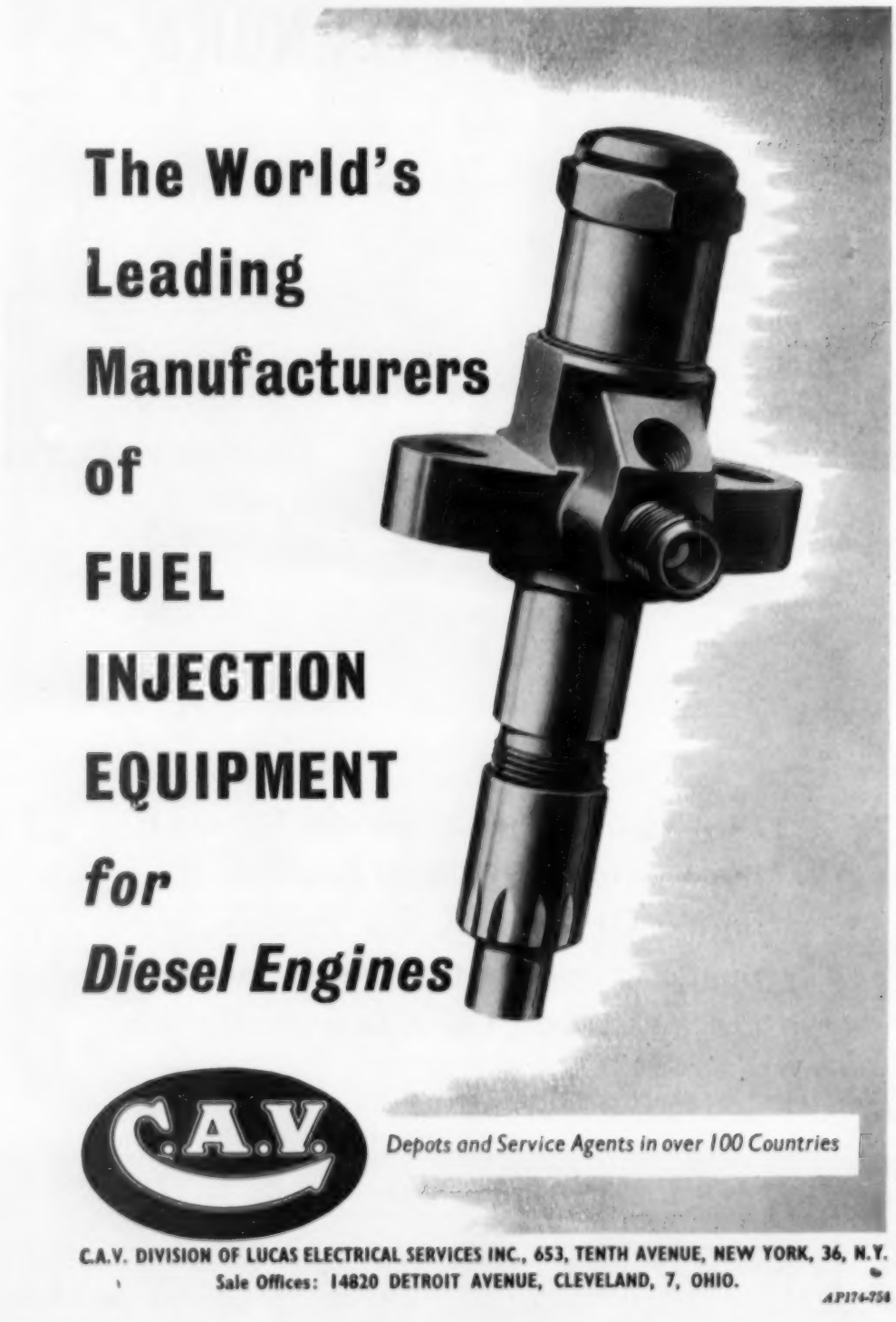
The largest all-aluminum boat ever built has been recently completed and put into service by the Loyd W. Richardson Construction Co. of Aransas Pass, Texas, according to reliable sources. The new boat, the *Stranger*, will be used for transporting crews to off-shore drilling locations. The craft is 40-ft.x13-ft.x3-ft. draft. It is one of the fastest all metal dieselized boats of its size in existence today. The boat is powered with a matched pair of General Motors 300 hp engines, twin screws, with 1:1 hydraulic reverse and reduction gears which were furnished by Stewart & Stevenson Services, Corpus Christi. These engines turn 20x19 wheels and at 1800 rpm the boat will cruise at 29 miles an hour. At 2100 rpm, it will make 34 miles an hour.

The *Stranger* is a extremely dry boat that handles well in rough water. The vessel is built of ¼-in. special salt water aluminum plate on bottom, ribs, and sides. The keel and stringers are also made of special salt water aluminum. The deck is made of 3/16-in non-skid aluminum plate and the cabin is made of 3/16-in. aluminum. All glass in the vessel is of the non-shatter type. Another interesting thing about this boat is the fact that the General Motors propulsion engines have aluminum cylinder blocks which further helps to keep overall weight down tending to increase speed.

Pacific Coast Sales Engineer

H. T. "Herb" Anderson

Appointment of Mr. H. T. "Herb" Anderson as sales engineer in the Pacific Coast Territory is announced by Mr. R. W. Bayerlein, vice president, Heavy Machinery Division, Nordberg Manufacturing Company, Milwaukee, Wisconsin. Mr. Anderson will assist Mr. C. G. Cox, Pacific Coast district manager, and serve the states of California, Oregon, Washington, Idaho, Nevada, Utah and Arizona. While holding the positions of design engineer, project engineer, manager of the New York district office, and assistant general sales manager for Enterprise Engine & Machinery Company, Mr. Anderson has gained a comprehensive background in the design, production, and sales of diesel engines. As manager of the New York office for eight years, he established an enviable reputation for directing sales and was promoted to assistant general sales manager in 1953.



President Internal Combustion Engine Institute

B. G. Van Zee

Newly elected president of the Internal Combustion Engine Institute, representing manufacturers in the high-speed gasoline and diesel engine fields, is B. G. Van Zee, chief engineer, Automotive Engineering Division, Minneapolis-Moline Company of Minneapolis. Other officers elected at the Institute's February meeting were: vice president, E. Don Tull, vice president and general manager, Cummins Engine Company, Inc., Columbus, Indiana; secretary, H. W. Smith, consulting engineer, Engine Division, Caterpillar Tractor Company, Peoria, Illinois and treasurer, Phil Norton, vice president in charge of sales, Wisconsin Motor Corporation, Milwaukee.

J. E. Heuser, general manager of the LeRoi Division, Westinghouse Air Brake Company of Milwaukee, former president of the Institute, was elected to the Board of Directors.

Opens N. C. Office

R. R. MacDonald

Expansion of the Cummins regional organization has been announced by Cummins Engine Company, Inc., of Columbus, Indiana, with the opening of the Piedmont regional office at Greensboro, North Carolina. In charge of the Piedmont region, which consists of the States of Virginia, West Virginia, North and South Carolina, is R. R. MacDonald. Mr. MacDonald's headquarters in Greensboro will be at 601 North Elm Street. Previous to his latest appointment, Mr. MacDonald was manager of the Cummins Diesel Sales Corporation branch at Milwaukee, Wisconsin. He also spent four years in various capacities with the Cummins Diesel Sales Corporation branch at Memphis, Tennessee.

Becomes President of Diesel Power, Inc.

Arthur A. Brown

Russell C. Vance

Mr. Arthur A. Brown, chairman of the board of directors of Diesel Power, Inc., announced that Russell C. Vance was elected president of the company at a recent directors meeting. Before joining Diesel Power this month Mr. Vance was district manager of coal, Joy Manufacturing Company, Pittsburgh. He has been associated with Joy in an executive sales capacity since 1941, during which time the company moved from third to first place in its field. Prior to joining Joy he was assistant manager of Cardox Corporation.

According to Mr. Brown, the accession of Mr. Vance highlights the company's current sales emphasis and growth. Diesel Power earnings, he states, were higher this January than in any month since the company was organized. He further states that the company has tripled both production and employment in the last 6 months. Diesel Power, Inc., Greenville, Pa., are designers and manufacturers of The Weathermaster wind machine for dispelling frost and fog, now being used on the New Jersey Turnpike and in California orange groves. They operate a precision machine plant, and are also manufacturers of Wielands Metal Worker.

Sets Up Own Firm

Joseph C. Buerkle

After a 35-year association with the C. Lee Cook Company as sales and service engineer for the New York area, Joseph C. Buerkle has set up his own firm, the Joseph C. Buerkle Company. Offices are at 76 Broad Street, New York City. The new Joseph C. Buerkle Company will represent C. Lee Cook throughout the Northeastern United States. The Company manufactures industrial piston rings, valve plates and packings.

Murray & Tregurtha

HARBORMASTERS

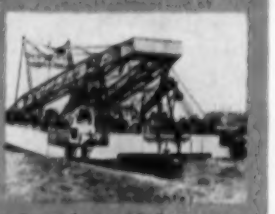
solve tough marine power and steering problems!

Models from 40 to 400 h.p. (Series O-4 illustrated; 40 - 50 h.p., Gas or Diesel).

Steer in any direction with full power

Easy service and low operating costs

Protection in shallow water



Rugged, trouble-free performance

You can solve your tough power and steering problems with Harbormaster Outboard Propulsion and Steering Units . . . the complete heavy duty marine power packages. They are quickly and easily installed for immediate use. They are efficient, economical to operate and maintain . . . and they have many special features not found with ordinary marine power, so they are the answer to many tough marine problems.

If you need easily installed power, better steering control, safety in shallow water, easier maintenance, more efficient performance, simpler hull design, more cargo space, bigger payloads, or simplified crew operation . . . you should investigate the benefits of Harbormaster Outboard Propulsion and Steering.

Send for your copy of the new Harbormaster Catalog today. You'll find detailed information and also many interesting Harbormaster installation photos.

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STRATOFLEX
"211"

√ FLEXIBLE HOSE ASSEMBLIES

√ RE-USABLE HOSE FITTINGS

√ ALL-PURPOSE HOSE

STRATOFLEX 211 Hose is designed for a wide range of industrial uses. Its flexibility, small bend radii, durability, and light weight afford time-saving installation and long service. Complete line of detachable fittings available. Order from your local dealer or write for free catalog.

Dealers' Inquiries Invited

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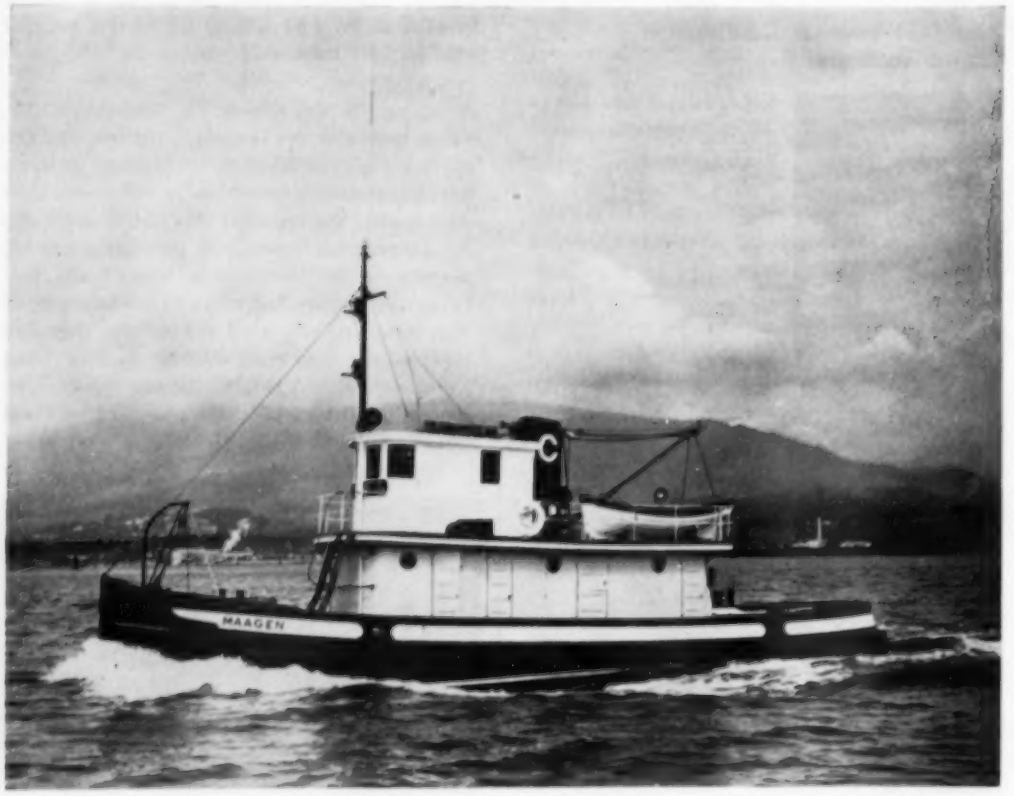

TUG GETS NEW ATLAS ENGINE IN THIRD REPOWERING INSTALLATION

THE story of the M. V. *Maagen* might very well be entitled "I Led Three Lives." For this venerable west coast tugboat started her career back in 1909 as a steam vessel. Twenty years later she was converted to diesel and started her second existence. Now, at 45, she has started her third life with a new Atlas Imperial diesel and is spryer than she ever has been.

The Atlas Imperial Model 35 S2X-6 is a vertical the M. R. Cliff Tugboat Co., Ltd., of Vancouver, B. C. All accomodations were modernized at the time the new engine was installed. Since that time, the boat has logged 1200 hours, with trips from two to six weeks along the rugged British Columbia coast. Wilmont Cliff, managing director of the M. R. Cliff Co., says that the engine has performed exceptionally well, with the tug handling a 34-section flat boom in tow.

The Atlas Imperial Model 35 S2X-6 is a vertical 6 cylinder, 4 cycle, medium-speed engine with a bore of 6½ inches and a stroke of 8¼ inches. Equipped with an exhaust driven Brown-Boveri turbocharger, it is rated at 300 bhp at 1225 rpm.

Operation of the turbocharger is fully automatic at all speeds and loads. Gases moving out through the exhaust manifold turn the gas turbine section of the turbocharger. A centrifugal blower on the other end of a common shaft draws in air, supplying it under pressure and in greater amount to the intake manifold.

The engine is equipped with a 3 to 1 Snow and Nabstedt reverse reduction gears and a Twin Disc power takeoff. Lube oil and fresh water cooling is provided by a Kewanee-Ross heat exchanger. The engine turns the 63 by 28 inch Osborne propeller to its rated rpm on the tow, and exhaust temperatures never exceed 610 degrees.

Lowering the Atlas Imperial, Model 35-S2X-6 diesel with Brown Boveri turbocharger into the *Maagen* during her repowering job.

Assistant Secretary

S. E. Johnson, Jr.

At a recent Board of Directors' meeting, S. E. Johnson, Jr. was elected assistant secretary of The Cooper-Bessemer Corporation. Joining Cooper-Bessemer from his own private law practice, Mr. Johnson was legal assistant to the treasurer. In 1952 he was appointed assistant treasurer, a position he held until his present election of assistant secretary. In his capacity as assistant secretary, Mr. Johnson has staff responsibility for Cooper-Bessemer's industrial relations. He also serves as the Company's legal officer and acting secretary. A graduate of Denison University, Mr. Johnson has his law degree from the University of Michigan Law School.

Elected President of Centrico Inc.

O. Muller-Habig

The appointment of Mr. O. Muller-Habig as president has been announced by Centrico Incorporated, Englewood, N. J. He succeeds Mr. Heinz W. Habig who died late last summer in the Shannon River air crash. Mr. Muller-Habig is a director of Westfalia Separator A. G. (Oelde, West Germany), manufacturers of centrifugal separators used in fluid processing industries such as dairy, beverage and petroleum. Centrico Incorporated is the sole distributor and representative in the United States of Westfalia Separator A. G.

For many years, Mr. Muller-Habig has been business manager for Westfalia in Oelde. Prior to his association with the company he spent several years in business in England. Educated in Germany and Switzerland, Mr. Muller-Habig is 47 years old and is the brother-in-law of Centrico's late president. The Muller-Habigs will reside in West Englewood, New Jersey.

New Model Temperature Switch

Amot Controls Corp. has released for sale its new model 1440 temperature switch. These switches utilize the standard Amot wax type of thermostatic power element to operate a microswitch. Because this arrangement operates within a narrow temperature range, a switch of high accuracy and reliability is obtained. The total motion of the element is ¼-in. over a 20°f temperature, so that a motion of approximately .012 in. per degree is obtained. With such a large stroke, there is no chance for the switch to get out of calibration when it is installed on the engines where large twisting forces are applied. These switches are available with a standard ½ in. pipe tapped hole for conduit, or with a quick disconnect plug. Switches available are single pole, double throw, 15 amp ac; double pole, double throw, 10 amp ac; and single pole, double throw 10 amp dc. Temperature settings available are between the ranges of 102 and 225°f.

The units with double pole, double throw switches are primarily intended to ground the magnetos on dual magneto gas engines on high jacket water temperature. All models can be used to sound alarms on high jacket water or lube oil temperatures, and they can be used for other forms of control applications. Write to Amot Controls Corp., Richmond 1, Calif., for bulletin #218.

Dieselized Ditcher

"Mac" MacDaniels, operator of the repowered Barber-Greene ditch digger, reported that the new GM 3-71 diesel is easier to run, does more work and has larger reserve power in case he runs into some extra hard rock.

A large part of the sub-surface of South Florida is of oolite or coral rock formation. Because of this a unique procedure is being used on a storm sewer project on state highway No. 9 near U. S. highway No. 1. Instead of using the conventional sewer pipe, the rock walls of the ditch with an 8 inch steel reinforced concrete slab is used, which results in considerable savings.

The 8 foot by 2 foot wide trench is being dug by a Barber-Greene #44 trench digger which was recently repowered from a gasoline engine to a General Motors 71 by the Miami office of the Florida Diesel Engine Sales, Detroit Diesel Engine Division, General Motors Corp.

Mr. P. M. Walker, superintendent of maintenance for the Vaughan Construction Co., reported that with the old gasoline engine the ditcher used 42 gallons of gasoline a day but with the new GM diesel they use 28 gallons of fuel in the same working period or a savings of approximately $7.50 a day plus being able to do more work with a larger reserve of horsepower and he expects it to pay for itself in a few months.

it's what's inside that counts

THE EFFICIENCY OF

Luber-finer

PATENTED PROCESS

PACK

HAS NEVER BEEN EQUALLED

STANDARD of the INDUSTRY SINCE 1936

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

√ Protects engine

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc., from oil, and is engineered to keep the **filtering media** and the **removed contaminants** from migrating back into engine.

√ Extends periods between drains

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

√ Takes less oil

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

LUBER-FINER PACKS AVAILABLE:

1. ***REFINING PACK***—Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. ***DIESELPAK***—First made available in 1941, the DIESELPAK was primarily designed for use with H. D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

Write for complete information to Dept. 28

LUBER-FINER, Inc.
2514 S. Grand Ave., Los Angeles 7

Gulf Coast Diesel News

By Michael T. Pate

HARMS MARINE SERVICE, Orange, Texas, has bought two General Motors series 110 6-cylinder marine diesels, each equipped with 3.75:1 hydraulic reduction and reversing gears. The matched engines will drive a 65-foot crew boat. The same craft will be equipped with two Stewart & Stevenson model 2GD20 auxiliary generating plants, each powered by a General Motors series 71, 2-cylinder diesel.

TODD SHIPYARD, Galveston, Texas, has bought from Mustang Tractor & Equipment Company, Houston, a model D-13000 Caterpillar diesel which will be governed at 900 rpm. The diesel will repower a 20-ton Orton crane.

U.S. OIL COMPANY of Louisiana and Texas, Houston, has bought from Stewart & Stevenson Services, Inc., of Houston, two Stewart & Stevenson model 3GD30 ac generating units, each driven by a General Motors series 71, 3-cylinder diesel. The units will be mounted on an offshore platform for lighting service.

PURE OIL COMPANY, Houston, has bought through the Diesel Division, Fairbanks, Morse & Company, two model 38F5¼ 6-cylinder marine diesel engines, each rated at 450 hp. The engines will power craft in the company's offshore activities.

TEXAS GULF SULPHUR Company, Houston, has secured through Stewart & Stevenson Services, Inc., four series 110 General Motors 6-cylinder diesels which will be used to drive centrifugal pumps.

WILSON MANUFACTURING Company, Wichita Falls, Texas, has bought from Waukesha Sales & Service, Inc., Houston, three model 6LRDBSU diesels, rated at 500 hp each. The diesels will be used to power an oilwell drilling rig.

GLENN W. KING COMPANY, Houston, has bought a General Motors series 71 quad-six diesel to drive a Morse hydraulic dredge pump on a dredge being equipped for Texas Gulf Sulphur Company. The same dredge will also have a General Motors diesel, series 71, 6-cylinder, to operate the swing gear on the ladder. Two General Motors series 71 2-cylinder diesels will each drive a 20 kw dc generating set on the dredge, providing lighting and auxiliary power. All GM diesels were bought through Stewart & Stevenson Services, Inc., Houston.

ACKERMAN & SON, Blessing, Texas, have secured from Mustang Tractor & Equipment Company, Houston, a model D-13000 Caterpillar diesel developing 190 hp at 1200 rpm The diesel will drive a deep well irrigation pump.

ARRENDELL LUMBER COMPANY, Cleveland, Texas, has bought from Stewart & Stevenson Services, Inc., a series 110, General Motors diesel, rated at 220 hp, which will power the company's portable sawmill.

PFEFFER & SON Warehouse Company, Houston, have bought a Stewart & Stevenson model 3GD30 30 kw ac generating set, powered by a General Motors series 71 3-cylinder diesel. The unit will be installed in a new blending and storage plant for rice being constructed for the company.

THE CITY OF TERRELL, Texas, has bought from the diesel division, Fairbanks, Morse & Company, two model 38D8-⅛ 1600 hp dual fuel engines which will be installed in the power plant.

WALKER-NEER MACHINE Company, Wichita Falls, Texas, has secured from Waukesha Sales & Service, Inc., of Houston, a model 190DLCU Waukesha diesel rated at 60 hp at 200 rpm.

You will be among the first to receive a copy if you order now. The same price as in former years, $10.00 for a reference volume that grows more valuable as each year passes.

CALMES ENGINEERING COMPANY, New Orleans, has bought from Stewart – Stevenson Services, Inc., of Houston, a matched pair of series 110, 6-cylinder General Motors diesels, equipped with 3.75:1 hydraulic reversing and reduction gears. The craft which they will power will have for auxiliary use a Stewart & Stevenson dc generating set driven by a series 71, 2-cylinder GM diesel.

C. A. McKINLEY & SONS, Beaumont, Texas, have bought through Mustang Tractor & Equipment Company, Houston, a model D-364 Caterpillar diesel rated 235 hp at 1225 rpm which will be used to repower their harbor tug, the *J. S. Otis*.

PICTON TOWING COMPANY, Port Arthur, Texas, has secured a series 110, 6-cylinder General Motors marine diesel equipped with 3.75:1 hydraulic reversing and reversing gear which will power a towboat in the company's fleet.

DIESEL ENGINE CATALOG

Volume 20

YOUR COPY OF VOLUME 20, DIESEL ENGINE CATALOG

OFF THE PRESS AND READY TO MAIL JUNE 15–

Most editorial matter is either entirely new or extensively revised this year. The reason is that manufacturers of engines and accessories have brought out so many new models and products, and have revised so many old ones. You will need this new book to keep posted on a rapidly-moving industry.

The size and format of this new edition of the "bible of the industry" is the same as has proved so successful during the last 19 years. You will find the following sections:

1. ENGINES. All major manufacturers of diesel, gas, and dual-fuel engines are represented. Text is supplemented with specifications, power curves, photographs and sectional views.

2. SUPERCHARGERS & TURBOCHARGERS. This section also is fully illustrated to help you keep abreast of developments in this expanding phase of the industry.

3. TRANSMISSIONS. This section gives you the latest information on torque converters, fluid drives, and other modern means of transmitting power.

4. ACCESSORY EQUIPMENT. Recent developments in fuel injection systems, control devices, and other auxiliary units are covered in this section.

5. MARKET PLACE. You find here a convenient, time-saving listing of sources from which you can obtain the multitude of items and services needed by the growing diesel industry.

6. ADVERTISING. Information of value to you is refined and presented attractively by professional advertising talent in this important section of Volume 20.

For ease in ordering, use the form below.

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Forms New Department

The Schneider Manufacturing Corporation, of Muncie, Ind., a wholly-owned subsidiary of the Westinghouse Electric Corporation, has been dissolved to form the hydraulic drives department of the Westinghouse gearing division. The Schneider Manufacturing Company was purchased by Westinghouse in October, 1954. The hydraulic drives department will sell, engineer, and manufacture hydraulic torque converters and associated brakes and transmissions. Headquarters of the department will remain in Muncie, Ind.

"The entrance of Westinghouse into the torque converter field," Mr. L. R. Botsai, division manager said, "is a natural adjunct to the production of power transmission equipment. Our production of torque converters and associated equipment at Muncie will be concerned mainly with industrial applications and not with equipment such as is involved in automobile transmissions."

Three key appointments were announced for the new department. They are: S. M. Johns, sales manager; T. P. Dunkin, manager of manufacturing; and P. L. Fosburg, engineering manager.

Announces Executive Promotions

The Trane Company of La Crosse, Wis., announced the election of three executive vice presidents and a vice president to broaden the management staff for further growth of the firm. Elected to the new positions of executive vice presidents were: R. James Trane, who is also president of Trane's wholly-owned subsidiary, the Trane Company of Canada, Ltd., Wayne J. Hood, who has been vice president and treasurer; and Thomas J. Hancock, who has been vice president in charge of sales. Richard H. Pearse, Sr., purchasing agent, was elected to the position of vice president. Mr. Hancock, was named to fill the new, seventh, position on the Board of Directors.

D. C. Minard, president of the Trane Company, major manufacturer of air conditioning, heating and ventilating equipment, said the executive promotions are part of a gradual broadening of the management structure required by the firm's projected growth trend.

Trane sales, estimated at more than $55 million this year, have increased 350% in the last 10 years.

Resigns Post

Carlos D. Kelly, of Rumson, N. J., announces his resignation as vice-president in charge of Sales for Purolator Products, Inc., manufacturer of automotive oil filters and other filtration equipment, of Rahway, N. J. Mr. Kelly has announced no plans for the future.

Mobile Workbench

The Overbeke-Kain Company has announced the manufacture and availability of heavy-duty portable workbenches that can be used for maintenance, assembly, repair and other similar operations. The new bench has been developed to meet the demand for a "mobile" unit containing tools that can be moved by one man to work locations. The bench has a cabinet, three shelves, a drawer, plus two doors that can be locked shut. An extension cord and "plug in" connection can be furnished to facilitate use of electrical tools. Utilization of the bench gives portability to many shop tools such as, small drill presses, bench grinders, hand presses, etc. In many instances, the "mobile bench" effects savings by enabling a workman to move from job to job quickly and easily.

This welded all-steel unit, designed for hard continuous service, is fabricated of ¼-inch and $\frac{3}{16}$-inch steel plate. Capable of supporting 2,000 pounds safely, the "mobile bench" weighs 325 pounds. In addition, this unit has heavy-duty roller bearing casters and tires of hard rubber or composition plastic. A foot operated locking mechanism holds workbench in position . . . assures solid working surface. The standard unit shown is 34-inches high (not including vise), 41-inches long and 26-inches wide. Table top is 24 x 36-inches. Mobile workbenches can be supplied in various sizes to meet individual requirements. Literature will be sent on request to File 119, DIESEL PROGRESS, Cole Station, Los Angeles 46, Calif.

Water Power Booklet

"Water Over the Dam," a 24-page booklet which traces the development of American water power from colonial days to the emergence of the electric power era half a century ago, has been released by Allis-Chalmers Manufacturing Company. This history begins with a reference to the first application of water power on the North American continent —the grist mill at Port Royal, Nova Scotia, the settlement of which was established in 1605. It highlights water power developments from that period until around the turn of the 19th century. Written by Edward Uehling of Allis-Chalmers hydraulic section and reprinted from the 3rd and 4th Quarters, 1954, of the company's Electrical Review, "Water Over the Dam," is illustrated with interesting diagrams and photos of early water wheels. Copies of "Water Over the Dam," 02R8232, are available on request from Allis-Chalmers Manufacturing Company, 961 S. 70th Street, Milwaukee, Wisconsin.

Schwitzer-Cummins Appointments

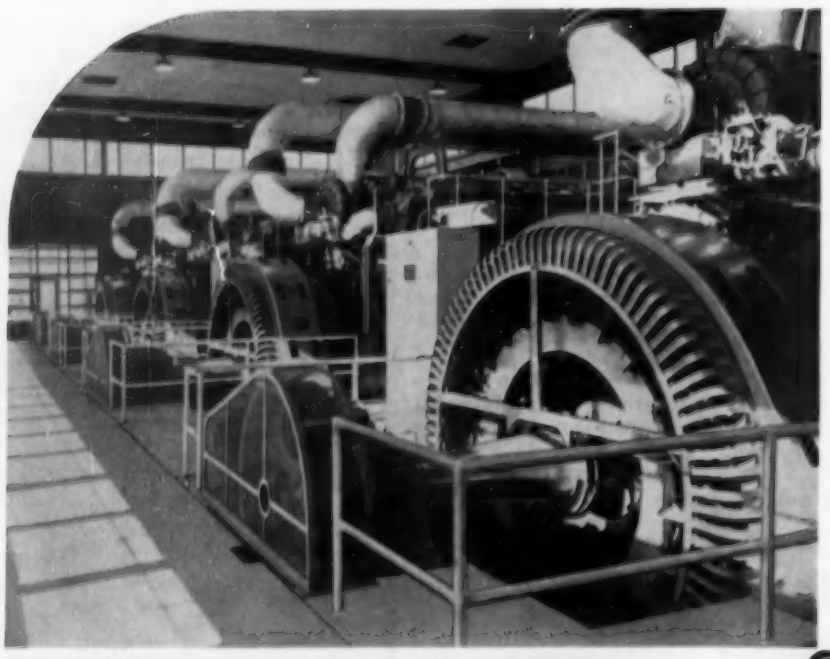
James A. Hardy Thomas J. Weir

The Schwitzer Cummins Co. of Indianapolis, Ind., has announced two new engineering appointments. James A. Hardy has been appointed to the position of executive engineer and Thomas J. Weir has been appointed assistant chief engineer.

Ingersoll-Rand Motorpumps

A completely new 24 page Motorpump Bulletin, Form 7093-E, has been released by Ingersoll-Rand. This new piece of literature covers their entire line of close-coupled Motorpumps from ¼ to 75 horsepower sizes for delivery of 5 to 2800 gallons per minute. The bulletin is designed to make it easy to select the correct size and model. A visual and concise index shows the basic classifications of pumps covered with their specifications. Anyone desiring a copy of the bulletin should contact the nearest Ingersoll-Rand branch office or write Ingersoll-Rand, Cameron Pump Division, 11 Broadway, New York 4, N. Y., and request Form 7093-E.

Again IDEAL Equipment *is part of a prize-winning* PLANNED EFFICIENCY *plant*



When sustained peak output volume and production economy are the goals in your power plant planning—you will do well to seriously consider IDEAL Equipment. It is no mere accident that IDEAL Generators are found in so many high efficiency plants throughout the world. Experienced engineers know that IDEAL equipment is engineered, built, and does perform to the highest standards.

IDEAL Engineers are always ready to work with you on Generator and Motor problems. Write today.

← This photo shows the four IDEAL Alternators installed at Poplar Bluff, Mo.; Type SAM 2351 KW, 80% PF 2938 KVA, 4160 Volts, 3 ph. 60 cy, 327 RPM. Four Exciters Type D 30 KW, 125 Volts, 1750 RPM.

All accessory motors are also IDEAL.

These photos show the Diesel Progress REA Efficiency Plaque and the prize-winning Green Forest Station of the M & A Electric Power Cooperative, Poplar Bluff, Mo.

The IDEAL ELECTRIC & Manufacturing Co., Mansfield, Ohio

Builders of DEPENDABLE POWER EQUIPMENT for over 50 years

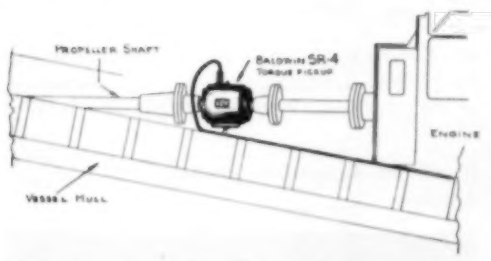
Cooper-Bessemer Vice President

Fletcher Devin

Fletcher Devin has been elected a vice-president of The Cooper-Bessemer Corporation. The election was made by the board of directors at the year-end meeting in Mount Vernon, Ohio. The election to vice-presidency high-lights 35 years of service Mr. Devin has had with the company starting as a sales trainee and working up through engineering and sales.

For the past 20 years Mr. Devin has directed the development of Cooper-Bessemer's locomotive markets for which Cooper-Bessemer supplies diesel engines. He is also currently district sales manager for the territories of Ohio, Kentucky, Michigan, West Virginia and Tennessee, for engineering and sale of Cooper-Bessemer engine-driven compressors used in gas pipeline transmission and in refinery applications.

Power Output Test



Schematic assembly of the Baldwin SR-4 Torque Pick-up as installed on a U. S. Coast Guard Patrol Cutter. The Torque Pickup housing is restrained from rotating by a piece of steel strap $\frac{1}{16}$ x 1 x 8 inches.

Power output of Coast Guard Patrol Cutter engines and the efficiency of propellers in using their power were tested recently by a new and simpler method developed by U. S. Coast Guard naval engineers. The new tests were set up by aligning and coupling a Baldwin SR-4 Torque Pickup between the engine shaft and the propeller shaft on the vessel. The torque pickup consists of a short shaft on which four SR-4 resistance wire strain gages are bonded and electrically connected together to form a Wheatstone bridge. Also on the shaft are slip rings which maintain electrical connections between the rotating bridge circuit and an SR-4 Strain Indicator with power supply. Strain readings are translated into terms of torque. Readings were taken in the engine room and horsepower computed immediately.

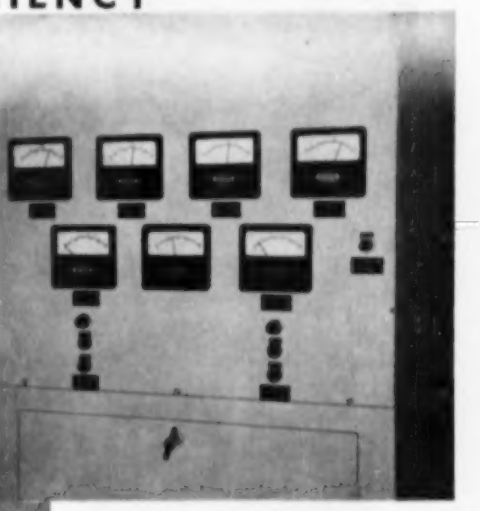
The test method permits measuring the shaft torque and power output of the engine electrically with an indicator placed at any convenient distance or location in the vessel for measuring the strain in the shaft. Results showed not only whether the engine would deliver its rated power but whether the propeller had the right diameter, number and pitch of blades for efficient use of the power, and how the vessel was affected by the power available to the propeller. The test method has been used on an 83-foot patrol cutter and on a 40-foot utility boat.

DEPENDABLE MEASUREMENT
+ FUEL ECONOMY
PRODUCTION EFFICIENCY

LIQUIDOMETER fuel gauging systems provide dependable measurement for economical and efficient power plant operation. M & A Electric Co-op's generating plant at Poplar Bluff, Mo. credits planned efficiency for their award-winning production cost of 6 mills per net kilowatt hour.

This efficiency is emphasized by the fact that no fuel saving is too small to rate attention from M & A management. Dependable gauging means fuel economy.

A battery of 7 LIQUIDOMETER Juniors provides automatic remote level indication of the engine lubricating oil sumps, clean and used oil tanks and a 9000-gallon underground storage tank. Another LIQUIDOMETER with a high-level alarm is installed in the metering system between the fuel oil day tank and the overflow drain tank.



THE LIQUIDOMETER CORP.
36-24 Skillman Ave., Long Island City 1, N.Y.

A striking example of LIQUIDOMETER's versatility and dependability in liquid level gauging applications. Write today for information on how we can assist you in your gauging problems!

GET THE FULL FULL-FLOW STORY

See for yourself the vast difference in this patented all cellulose disc-pac filter cartridge . . . see for yourself a new and modern full-flow filter tank with all controls completely visible at eye level. See how tools are entirely eliminated. SEE ALSO what vast economies in piping . . . in operation and how engine repairs and down-time are CUT TO THE BONE.

Briggs
PIONEERS IN MODERN OIL FILTRATION

A COMPLETE DESCRIPTION OF MODERN

FULL-FLOW OIL FILTRATION

DO YOU HAVE A PROBLEM?
WRITE US ABOUT IT . . .

PASTE THIS ON A 2¢ CARD AND MAIL

YES! THE BRIGGS FILTRATION COMPANY, DEPT. 59, WASHINGTON 16, D. C.
Send me your new 4 page description of new and modern full-flow oil filtration.

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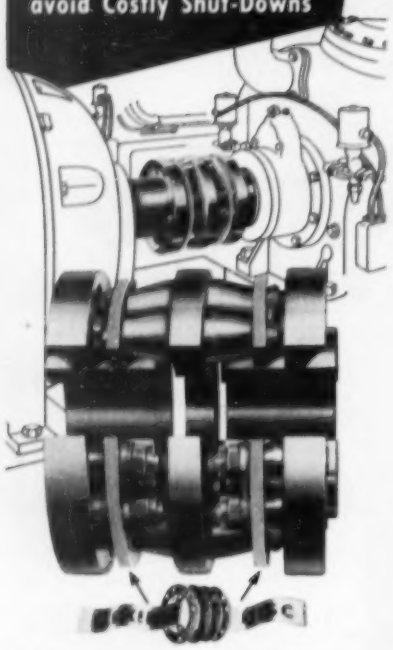
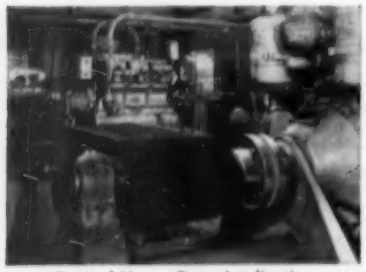
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



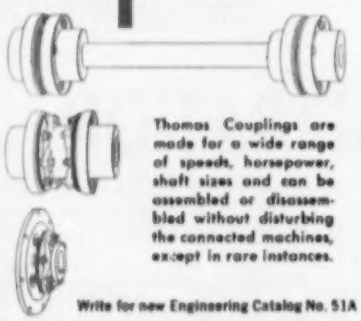
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Typical Heavy Duty Application on Multiple V-Belt Drive

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Purolator Executives

James D. Abeles

H. Joseph Markert

Election of James D. Abeles as president and chief executive officer of Purolator Products, Inc., Rahway, N. J., manufacturer of automotive oil filters and other filtration equipment, and H. Joseph Markert as executive vice-president has been announced. Mr. Abeles, will succeed Ralph R. Layte who becomes vice-chairman of the board of directors. Mr. Layte, in retiring as president of Purolator, has completed 30 years of service with the company. The new president is a resident of Mendham, N. J. Since joining Purolator Products Inc., in 1940, Mr. Abeles has filled many positions including that of assistant to the president, equipment sales manager, assistant works manager, assistant plant superintendent, quality manager, cost reduction engineer, and executive vice-president and general manager. He is a graduate of Stevens Institute of Technology and Massachussetts Institute of Technology.

Mr. Markert, a resident of Westfield, N. J., has served as comptroller of Purolator Products, Inc. He also is a vice-president and a director of the company. A graduate of Temple University, Philadelphia, and an active member of the American Institute of Accountants, Mr. Markert joined Purolator as general auditor in 1946.

Diesel Water Treatment

W. H. & L. D. Betz, consultants on industrial water problems, Philadelphia 24, Pa., announces the availability of Betz Diesel Water Treatment No. 68. This product is a buffered chromate type inhibitor, used for the control of corrosion in closed diesel engine systems. Complete instructions for the use of Diesel Water Treatment No. 68 are contained with the product. Under normal conditions, daily control testing is not required. Betz Diesel Water Treatment No. 68 is available in cans of 20 ounces each—40 cans to the case. For large systems, it is available in 400 pound fibre drum lots. Further information may be obtained by writing directly to W. H. & L. D. Betz Gillingham & Worth Streets, Philadelphia 24, Pa., or through DIESEL PROGRESS, Cole Station, Los Angeles 46, Calif.

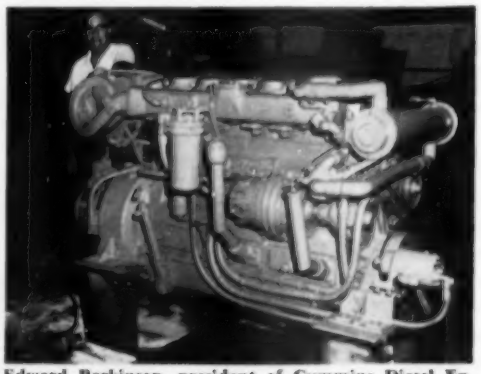
To Manage Shreveport Office

T. M. Lambeth, Jr.

The promotion of T. M. Lamberth, Jr., as manger of Cooper-Bessemer's Shreveport branch office has been announced by Robert F. Lay, general sales manager of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Mr. Lamberth fills the position formerly held by A. K. De France who died a short while ago. As branch manager, Mr. Lamberth will direct both sales and application engineering of engine-driven and motor-driven compressors, as well as diesel, gas-diesel and spark-ignited gas engines.

Mr. Lamberth will direct his activities out of the Cooper-Bessemer field office and warehouses located at 403 Lake Street, Shreveport, Louisiana.

Modified Cummins Diesel Engine



Edward Parkinson, president of Cummins Diesel Engines of Florida, Inc., standing next to the modified Model NRTM 600 Cummins diesel which is expected to develop better than 300 hp at 2100 rpm. An Elliott turbocharger replaced the regular supercharger.

Cummins Diesel Engines of Florida when called upon to produce more hp for a 60 ft. yacht and still keep the weight and size of the diesel down, decided to modify a model NRTM-600 Cummins diesel engine rated 300 hp at 2100 rpm. Instead of using the regular supercharger, the modification plan called for its removal and the installation of an Elliott turbocharger. The Sen-Dure heat exchanger was also changed. Other specifications were: 86-inch overall length; 29 $\frac{7}{8}$-inches above the crankshaft line and 11$\frac{1}{4}$-inches below the crankshaft line. This 6-cylinder Cummins diesel has a bore of 5$\frac{1}{4}$-inches and a stroke of 6-inches and a displacement of 743 cubic inches.

The *Snuffy* owned by C. G. Fuller and being built by Huckins Yacht Corp. at Jacksonville Fla. will also have two Capitol H. Y. C. D. 200 hydraulic reverse gears plus Huckins "V" drives.

Twin Disc Bulletin

Deprived of the precious "black gold" we call oil, today's highly mechanized civilization would grind to an instant and helpless stop. For oil is power, lubrication, heat, light, food, comfort, clothing, beauty, pleasure and freedom for Americans.

The vital part oil plays in every industry, and in every phase of industry, is told in an article titled "straight down to modern times," featured in the latest issue of "Production Road" magazine just released by Twin Disc Clutch Company, Racine, Wisc., a leading manufacturer of friction and fluid drives for powered industrial equipment.

Recent advances in design and performance for equipment used in the logging, earthmoving, construction and marine fields also are covered in the new issue of "Production Road." A copy of this colorfully illustrated publication may be obtained without cost by writing Twin Disc Clutch Company, Racine, Wisconsin.

Joins A. G. Schoonmaker

H. F. Neuman has recently joined the A. G. Schoonmaker Company, Inc.'s west coast office as sales engineer. Mr. Neuman was formerly in this position with Enterprise Engine & Machinery Co., and King Knight Company, Engineers, of San Francisco.

Radiator Breakdown Control

The newest development in chemistry for cooling systems of all internal combustion engines paves the way for complete control of radiator breakdown and deterioration has been announced by Shumer Products. This product, it has been claimed, completely stops the action of electrolysis on all metals, oxydation in blocks and scale formation. The manufacturer asserts that concluded tests lasting over two years show this statement to be a fact in every case. The product has been available for some time and acceptance has been universal wherever contact has been made.

Among all of its advantages of complete control is peak cooling for the motor at all times. With this in mind says Shumer "At last high setting thermostats can be used with assurance. Inquiries and requests for literature are handled promptly. Contact Shumer Products, Box 13, So. Pasadena Cal.

Dynamatic Air and Liquid Cooled Eddy-Current Brakes

Dynamatic Division of Eaton Manufacturing Company, Kenosha, Wisconsin offers eddy-current brakes and associated controls that satisfy numerous and varied braking requirements. A wide range of sizes and designs are available to meet most demands or can be built to suit individual conditions. Dynamatic eddy-current brakes, differing from friction brakes, have no mechanical contact between the rotor and stationary field; therefore, operation is smooth and completely free of shock.

Although most commonly used to provide a controlled load, specific applications for unwind stands in metals, fabric, plastic, and paper maintain constant linear speed or tension. High inertia masses are easily and smoothly stopped through controlled deceleration. Artificial loading in numerous applications permits accurate speed control of certain machine tools, crane hoists, and so forth. Prime movers are easily loaded for test or run-in purposes.

Standard units in both the air and liquid cooled types are described in bulletin BR-1. Construction details, capacities, characteristic curves, dimensions, and advantages are listed. A free copy will be forwarded upon request to Dynamatic Division, Eaton Manufacturing Company, Kenosha, Wisconsin.

New Tug Tending Drilling Rigs on Gulf

Answering the call for larger, more seaworthy craft to service offshore oil well drilling operations, which are constantly moving farther and farther out to sea, the Falgout Boat Company of Galveston, Texas has just added an all-steel 100-foot utility tug to its fleet operating on the Gulf of Mexico. The new tug is the *Tilman J.*, designed and powered to tow drilling rigs to locations in deeper waters and to move personnel, drilling equipment and supplies on schedule over the now greater distances covered from shore to barge.

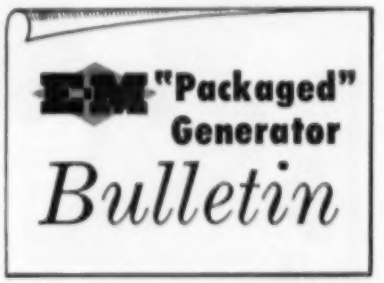
Powered by two General Motors 6-110 Tandem-Twin diesels turning twin screws the craft has an adequate and flexible range of power. Turning 56-in. by 46-in. four-blade propellers through four to one reduction gears the craft has logged a speed of 12 miles per hour. One or more of the four engines making up the twin units may be shut down when less than maximum power is needed.

She was designed and built by the Burton Construction and Shipbuilding Company of Port Arthur, Texas and was powered by Stewart and Stevenson Services, GM Diesel distributors, Houston.

Natchitoches, Louisiana, Approves Purchase of Two 3000 Kw Generators

The purchase of two 3000 kw, 2400/4160 volt engine-type generators for the city's diesel plant has been approved by the City Council of Natchitoches, Louisiana. The two units will be driven by 3870 hp, 257 rpm, dual-fuel engines. Each one will add 2750 kw to the plant capacity and supply 30 kw for a scavenger air compressor motor.

The present power plant has four generating units. Two 1500 kw units were installed in 1952. The new generators will be built by Electric Machinery Mfg. Company, and the engines by Baldwin-Lima-Hamilton.



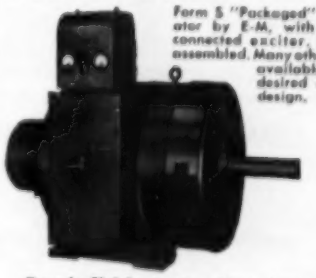
"ON-THE-SPOT" POWER WHEN YOU NEED IT

These "vest pocket" auxiliary power plants are operated by a large refining company. Such plants, comprising a diesel engine and a 100 kw E-M "Packaged" Generator, produce high-quality voltage right on the spot, for needs such as lighting, controls, communications, and even large pump motor starting and operation.

E-M "Packaged" Generators supply constant voltage automatically... dependably

● Simple, trouble-free, and dependable ... these E-M "packaged" units are *complete*. Generator, exciter, control, and all necessary components are integrated into one compact housing, ready to install and easy to connect. And no special switchboards or operating skills required!

Built-in voltage regulators assure a steady output whether generators are operated singly or in parallel. When load varies, voltage output is quickly returned to desired level.



Form 5 "Packaged" Generator by E-M, with direct-connected exciter. Factory assembled. Many other types available to fit desired engine design.

Sturdy E-M construction plus a minimum of moving parts gives you long service with only routine maintenance. Ratings to 187 kva, in speeds of 900 to 1800 rpm. Ask your nearest E-M sales engineer for more facts, and write for publications listed below.

ELECTRIC MACHINERY MFG. CO.
MINNEAPOLIS 13, MINNESOTA

Send for these informative brochures:

☐ "The A-B-C's of 'Packaged' Generators"
☐ E-M Synchronizer No. 35, Generator Issue
(2100-TPA-2147)

STOP THAT NOISE!
from Air, Steam and other gas discharges
with
BURGESS-MANNING SNUBBERS
WHAM
WHAM
WHAM
to a Whisper
Stop that noise and profit through better neighbor and employee relations. Avoid compensation claims.
Burgess-Manning Snubbers are engineered to effectively correct your specific noise problem.
Tell us your noise problem and let us recommend— no obligation
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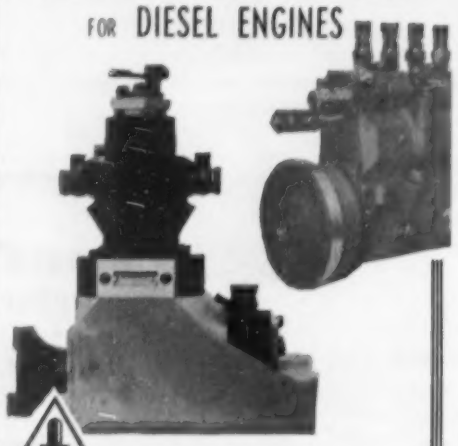
FUEL INJECTION EQUIPMENT
FOR DIESEL ENGINES



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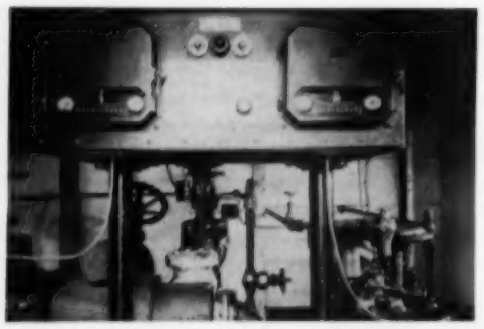
Three International Appointments

Walter H. Tudor

Donovan Stevens

The International Harvester Company has announced the appointment of Donovan Stevens to be in charge of industrial power sales to national user accounts, and the appointment of Walter H. Tudor as industrial power territory manager of the Chicago area. He will be in charge of contacts with distributors in the area for the distribution and sales of International industrial products. I. P. Payne, I-H manager of industrial power sales also announced the appointment of W. F. Hall as manager of the firm's industrial power central sales region. He replaces L. A. Coomer who has been transferred to the company's eastern sales region in another capacity.

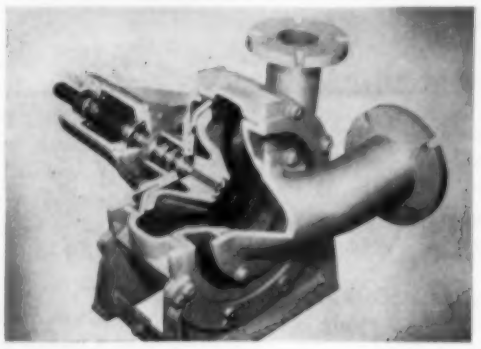
Continuous Automatic Blending of No. 5 Fuel Oil



Proportioneers, Inc., division of B-I-F Industries, Inc., Providence, R. I., has issued an application memo on "The Continuous Blending and Proportioning of Fuel Oils." This application memo, with diagrams and descriptions, illustrates the manner in which a newly-developed two component blender automatically delivers a uniform blend of #5 fuel oil directly into tank trucks, tank cars, ships or storage. The desired blend may be duplicated with accurate uniformity for any number of batches and produced as needed in much less time and at lower cost than is possible by manual methods.

This memo also explains how the Proportioneers Two Component Blender cuts fuel blending costs by eliminating the problems of added tank storage, mechanical mixing, stratification, and normal human errors, which are all inherent in manual batch-blending of fuel oils. For a copy of Application Memo L-25, write Proportioneers, Inc., 345 Harris Ave., Providence, R. I.

New Pumping Principle



A new type of pump has been introduced by the Western Machinery Company. It is based on a principle other than commonly used in pump design. It can pump, according to the manufacturer, anything from ready mixed concrete to delicate fruit without damage to the materials and a surprisingly small amount of wear to the pump mechanism itself.

Designated the Wemco Torque-Flow Pump, it operates on a unique materials moving principle. Its impeller is similar to an automobile fluid drive, and though entirely out of the material flow pattern, it induces a vortex (swirl) that does the pumping. The rotating fluid mass forms a buffer between the impeller and any solids which may be harmful to the pump. The unit is non-clogging inasmuch as the impeller is not in the line of material flow.

Full details on the Wemco pump is available from the manufacturer Western Machinery Company, 760 Folsom Street, San Francisco 7, Calif.

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Write for Catalog, become a Hancock dealer
You'll make money on over-counter sales; save plenty in your shop.

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7. Because of its simple and rugged construction, practically no maintenance is ever required.
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9. Compact in size and will operate in any position, which facilitates piping.
10. Available in pipe sizes up to 6" for all types of gas engines, diesel engines, and compressors.

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West Coast firm offers excellent opportunity for man with successful experience in sale of large diesel electric generator sets for stationary use. Must be free to travel. Salary open. All replies will be held in strictest confidence. Write DIESEL PROGRESS, File No. 515, Cole Station, Los Angeles 46, California.

Advertising Manager

G. J. Newhams

Dravo Corporation has announced the appointment of G. J. Newhams as advertising manager, replacing W. H. Collins who has resigned. Mr. Newhams previously was advertising manager of the company's Engineering Works Division and has been with Dravo since 1942. He is a member of the Industrial Advertising Council of Pittsburgh, Public Relations Society of America, Pittsburgh Ad Club and the Pittsburgh Chamber of Commerce.

Ultrasonics for Inspection and Cleaning

The Met-L-Chek Co., Los Angeles 47, California, has applied ultrasonic vibration to their visible penetrant inspection method with startling improvement in speed and effectiveness. The ultrasonic equipment is compact, moderate in price, and simple in operation. It can also be used for general surface cleaning when high efficiency soil removal is desired for plating, painting and other processing operations.

Manager of Dallas District

Lee Gruennert

T. L. Camp, general manager of Federal-Mogul Service, Detroit, Michigan, announced the appointment of Lee Gruennert as manager of the Dallas, Texas district. Mr. Gruennert, who has managed the company's Portland, Oregon district since 1948, began his new assignment at Dallas on March 1, 1955. He succeeds Walter T. Camp, who was recently announced as manager of the Chicago district, and his position at Portland has been filled by George W. Gardner.

With Federal-Mogul since 1930, Mr. Gruennert's experience in several responsible positions has given him a broad understanding of the automotive service business and thorough knowledge of the Federal-Mogul Service operation. He was originally employed in the San Francisco Manufacturing division, but was transferred shortly afterwards to help establish a service branch in Los Angeles. He served there for several years as rod shop supervisor and later became responsible for other internal operations of the branch as well as some sales functions. In 1937, Gruennert moved to Seattle, Washington to establish a Federal-Mogul warehouse.

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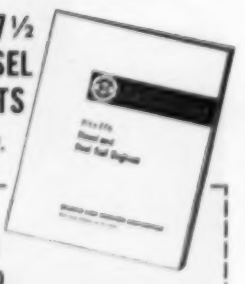

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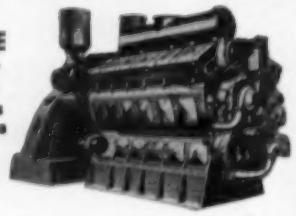

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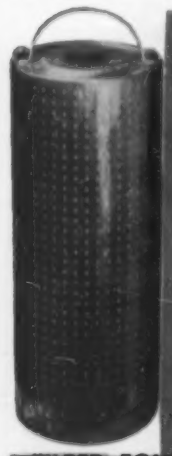

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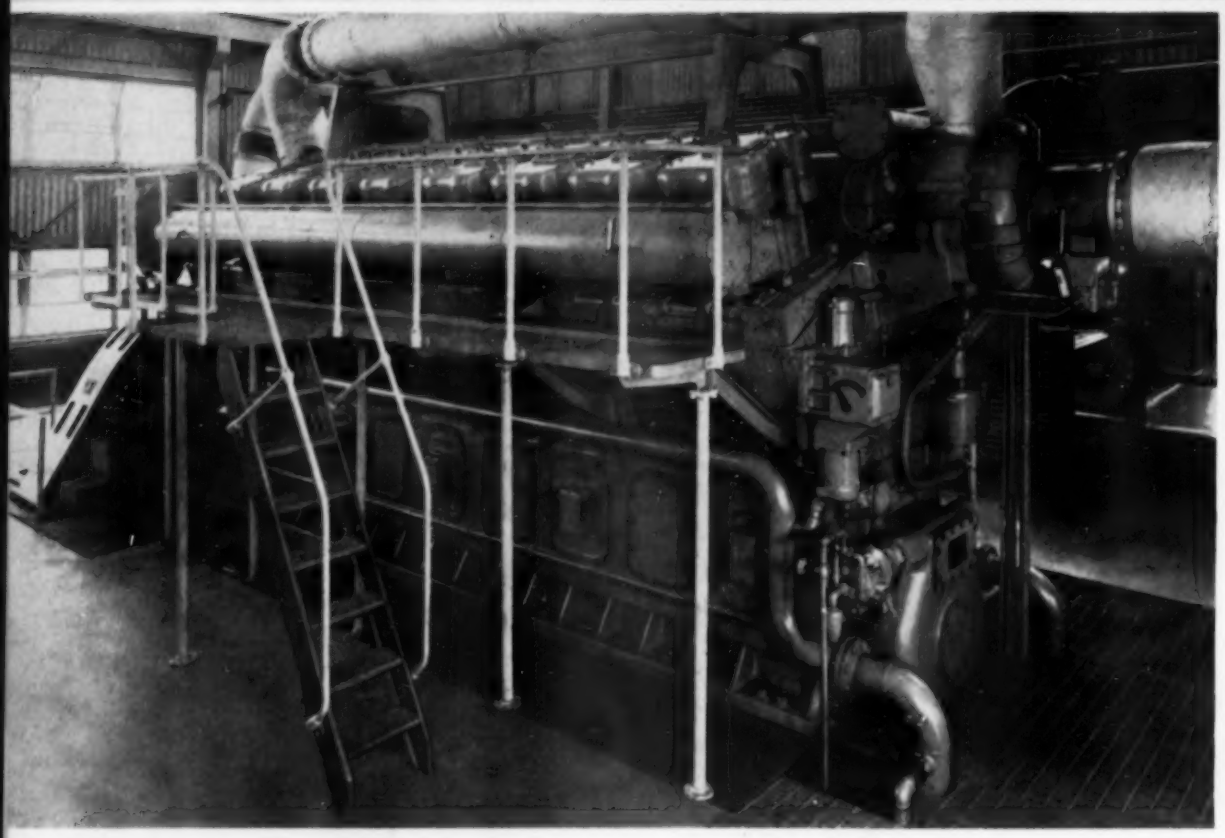

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